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Pine-feeding Webspinning Sawflies of the *Acantholyda posticalis* Group (Hymenoptera, Pamphiliidae)

Akihiko Shinohara

Department of Zoology, National Science Museum (Nat. Hist.),
3–23–1 Hyakunin-chô, Shinjuku-ku, Tokyo, 169–0073 Japan
E-mail: shinohar@kahaku.go.jp

Abstract Seven closely related species of pine-feeding webspinning sawflies are segregated into the *Acantholyda posticalis* group. They are *A. posticalis* (Matsumura, 1912) with three subspecies, the nominotypical subspecies from Japan (Honshu, Shikoku, Kyushu and Tsushima), *A. posticalis koreana* n. subsp. from Korea, and *A. posticalis pinivora* Enslin, 1918, from Europe, Siberia and China, *A. xiaoi* n. sp. from China (Shandong), *A. parki* Shinohara et Byun, 1996, from Korea and Russia (Primorskij kraj), *A. alpina* n. sp. from Japan (alpine zone of northern to central Honshu), *A. kojimai* n. sp. from Japan (montane to alpine zones of northern to central Honshu), *A. pirica* n. sp. from Japan (alpine zone of Hokkaido) and Russia (Sakhalin), and *A. kumamotoi* n. sp. from Japan (northern Honshu). Five new species and one new subspecies given above are described and illustrated. *Acantholyda parki* is newly recorded from Primorskij kraj and *A. posticalis posticalis* from Shikoku.

Key words: Pamphiliidae, *Acantholyda posticalis*, new species, new subspecies, new distribution records.

Acantholyda posticalis (Matsumura, 1912), as currently understood, is a widely distributed Palearctic species of webspinning sawfly associated with two-needled pines. It was first described by Christ (1791) from France under the name of *Tenthredo stellata*, but this name was a junior primary homonym of *Tenthredo stellata* Geoffroy, 1785, and Enslin (1918) proposed a new name, *Acantholyda pinivora* for Christ's taxon. Matsumura (1912), on the other hand, described *Lyda posticalis* from Japan, and Takeuchi (1930) synonymized *A. pinivora* Enslin with Matsumura's species. This synonymy has been generally accepted by subsequent authors.

Acantholyda posticalis has been recorded from various countries of Europe (Liston, 1995), Siberia (Verzhutskij, 1966, 1981; Kolomyietz, 1967), China (Xiao *et al.*, 1992; Xiao, 1992), Korea (Shinohara & Byun, 1996), and Japan, and regarded as a major pest of Scots pine (*Pinus sylvestris*) and European black pine (*Pinus nigra*) in Europe and Siberia (Roberti, 1951; Koehler, 1957; Kolomyietz, 1967; Pschorn-Walcher, 1982) and Chinese red pine (*Pinus tabuliformis*), Japanese red pine (*Pinus densiflora*) and Scots pine in China (Zhao *et al.*, 1992). A serious pest of five-needled Korean stone pine (*Pinus koraiensis*) was known in Korea as *A. posticalis* (Lee, 1961; Chung & Shin, 1985), but Shinohara and Byun (1996) treated it as a closely related

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but separate species, *A. parki* Shinohara et Byun, 1996.

A comparison of the specimens of "*A. posticalis*" from various parts of its distributional range has shown that the current concept of "*A. posticalis*" may be a composite of eight mainly allopatric, closely resembling but distinguishable units, which may differ also in their host preference. Of these, one from Shandong, eastern China, a pest of two-needled pines, *Pinus tabuliformis* and *P. densiflora* (Hsiao, 1963), shows fairly large differences from the other forms in the shape of the clypeus and the punctuation of the thorax. Three others, occurring mainly in alpine areas of Japan (one also collected in Sakhalin), are comparatively small and associated with five-needled pines. Another Japanese form, known from a single female from mountains of northern Honshu, has much in common with *A. parki* from Korea. The remaining three, distributed in Europe to Siberia and China, Korea, and Japan (lowlands to lower mountains), respectively, are quite similar to one another and they all are associated with two-needled pines; the European and Siberian populations are a notorious pest of *P. sylvestris* (*e.g.*, Koehler, 1957), the Chinese (Shanxi) populations are mainly associated with *P. tabuliformis* (Zhao *et al.*, 1986) and the Japanese and Korean populations are associated with *P. densiflora* (*e.g.*, Saito, 1928; see also discussion below).

In this work, I will propose to subdivide the current concept of "*posticalis*" into six species, one of them, *P. posticalis*, being represented by three subspecies. Of these, five species and one subspecies of *A. posticalis* will be described as new. These six species and *A. parki* Shinohara et Byun from Korea form a group of very closely related species, which is herewith called the *posticalis* group. Classification of this group of species is difficult owing to paucity of distinguishing characters, and this work is admittedly the first step for understanding the nature of this complex of closely allied forms. Obviously, much more information, particularly additional data on biology and host plants of each form and the material from vast areas of the Asian Continent, is needed to ascertain the validity of the taxa proposed here.

All the material used in this paper is kept in the National Science Museum, Tokyo, unless otherwise stated. Abbreviations for depositories are: DEI–Deutsches Entomologisches Institut, Eberswalde; FRIS–Forest Research Institute, Seoul; HU–Hokkaido University, Sapporo; KU–Kobe University, Kobe; MNHN–Muséum national d'Histoire naturelle, Paris; OMNH–Osaka Museum of Natural History, Osaka; SNU–Seoul National University, Suwon; UOP–University of Osaka Prefecture, Sakai; VL–Institute of Biology and Pedology, Vladivostok; YM–Yamaguchi Museum, Yamaguchi; ZMB–Zoologisches Museum, Berlin; ZMUM–Zoological Museum, Moscow State University, Moscow. For the classification of pines, I have followed a recent account by Price *et al.* (1998).

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The *Acantholyda posticalis* group

The species of the *posticalis* group are medium- to large-sized *Acantholyda* (length 9.5–15 mm in female, 8–12 mm in male), sharing the following set of characters: Black with pale yellowish to creamy white marking on head and thorax; wings often brownish but without distinct band below stigma; stigma nearly unicolorous pale brown to brown, often narrowly darkened basally but not distinctly bicolorous; abdomen pale brownish, usually with black areas particularly on dorsum. Head with postgenal carina very distinct; paraantennal field smooth, usually without distinct punctures and glabrous; forewing with cell C glabrous and stub of m+cu-a absent; hindwing with apical stub of 2A absent; male genitalia with distinct "additional lobe" of distivolsella (Eidt, 1969), except in *A. alpina*.

One widely distributed Palearctic species, with three subspecies, and six eastern Asian species are recognized in this species-group as follows:

a. Species associated with two-needled pines

Acantholyda posticalis (Matsumura, 1912)

Acantholyda posticalis posticalis (Matsumura, 1912)

Japan (central to western Honshu, Shikoku, Kyushu, Tsushima). Host: *Pinus densiflora*.

Acantholyda posticalis koreana n. subsp.

Korea. Host: *Pinus densiflora*.

Acantholyda posticalis pinivora Enslin, 1918

Europe to Siberia, China. Host: *Pinus sylvestris*, *P. nigra*, *P. tabuliformis*.

Acantholyda xiaoi n. sp.

China (Shandong). Host: *Pinus tabuliformis*, *P. densiflora*.

b. Species associated with five-needled pines

Acantholyda parki Shinohara et Byun, 1996

Korea, Russia (Primorskij kraj). Host: *Pinus koraiensis*.

Acantholyda alpina n. sp.

Japan (northern to central Honshu: alpine zone). Host: ?*Pinus pumila*.

Acantholyda kojimai n. sp.

Japan (northern to central Honshu: montane to alpine zones). Host: *Pinus parviflora*, *Pinus pumila*.

Acantholyda pirica n. sp.

Japan (Hokkaido: alpine zone), Russia (Sakhalin). Host: ?*Pinus pumila*.

c. Species without host information

Acantholyda kumamotoi n. sp.

Japan (northern Honshu).

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Key to species

1. Anterior margin of clypeus strongly produced medially, almost subtriangular in outline, with shallowly concave apex (Fig. 11 E); mesepisternum smooth, partly weakly coriaceous but not rugose, with very sparse small and/or large, shallow punctures. [Large and dark-colored species (female length 13–14.5 mm, head width 3.8–4.0 mm; male length 11–12 mm, head width 3.3 mm)]. China (Shandong). Associated with two-needled pines. ..... *A. xiaoi*

— Anterior margin of clypeus with median part produced with truncate or more or less concave apex, and each of lateral parts nearly truncate to distinctly produced (Fig. 11 D, F); mesepisternum more or less rugose, distinctly coriaceous, usually with rather dense, course punctures. 2

2. Anterior margin of clypeus with median half rather strongly produced with nearly truncate apex, each of lateral parts also distinctly, almost angularly produced (Fig. 11 A, F). [Medium-sized species (female length 12.5 mm, head width 3.2 mm; male length 10–12 mm, head width 2.7–3.2 mm)]. Japan (Hokkaido: alpine *Pinus pumila* zone), Sakhalin. Most probably associated with five-needled pine, *P. pumila*. ..... *A. pirica*

— Anterior margin of clypeus with median part weakly to rather strongly produced with nearly truncate or shallowly concave apex, but each of lateral parts not or only weakly roundly produced (Fig. 11 D). 3

3. Small species (female length usually around 11 mm, with range 9.5–12 mm, head width 2.6–3.0 mm; male length 8–9.5 mm, head width 2.3–2.7 mm); wings very faintly grayish infuscated, not brownish, with veins except for those along anterior margin weakly pigmented, thus rather inconspicuous. Female: Mandible usually with large black marking mid-basally on ventral surface; pale marking on mesonotum well developed, forming complete circle. Male: Mandible usually with small black marking mid-basally on ventral surface; [pale marking on mesoscutal lateral lobe usually present]. Japan (northern to central Honshu: alpine *Pinus pumila* zone). Most probably associated with five-needled pine, *P. pumila*. ..... *A. alpina*

— Larger species (female length usually over 12 mm, though varying from 11 to 15 mm, head width 2.9–4.0 mm; male length 9–12 mm, head width 2.6–3.4 mm) except for a small species, *A. kumamotoi* (female length about 10 mm; male unknown); wings usually distinctly brownish (except possibly in *A. posticalis pinivora*), with veins dark pigmented, conspicuous. Female: Mandible often without large black marking mid-basally; pale marking on mesonotum usually not well developed, at least broken at anterior part of mesoscutal lateral lobe (except often in two Korean forms, *A. parki* and *A. posticalis koreana*). Male: Mandibles without blackish marking on ventral surface; [pale marking on mesoscutal lateral lobe present or absent]. 4

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4. Female. 5
— Male. 10
5. Abdomen mostly pale brownish above, with only propodeum and sometimes narrow areas of a few basal segments or 9th segment blackish. 6
— Abdomen largely blackish above, at least propodeum and most of 2nd tergum and median part of other terga basally blackish. 9
6. Pseudosternum pale-marked. 7
— Pseudosternum entirely black. 9
7. Small species (length 10 mm, head width 3.2 mm); antennal scape largely pale brown above. Japan (northern Honshu). Host unknown. ..... *A. kumamotoi*
— Large species (length 11.5–15 mm, head width 3.4–4.0 mm); antennal scape mostly black. 8
8. Postocellar area depressed along median line, with distinct coronal suture; forewing with cell C often sparsely pilose. Korea, Primorskij kraj. Associated with five-needled pine, *P. koraiensis*. ..... *A. parki*
— Postocellar area not depressed along median line, usually without distinct coronal suture; forewing with cell C glabrous. Korea. Associated with two-needled pine, *P. densiflora*. ..... *A. posticalis koreana* (part)
9. Smaller species (length 11–13 mm, head width 2.9–3.3 mm). Pale area on paraantennal field separated from anterior part of supraocular stripe; antennal scape usually mostly black; pale mark on mesonotum not connected into a circle, broken at least in anterior part of mesoscutal lateral lobe; mesepisternum often largely black; pseudosternum usually without pale marking; wings slightly but distinctly brownish; dorsum of abdomen usually largely pale brown, with a few basal segments and basal parts of other segments blackish, but sometimes largely blackish; venter with black basal part of each segment usually more or less visible. Japan (northern to central Honshu: montane to alpine *Pinus pumila* zones). Associated with five-needled pines. ... *A. kojimai*
— Larger species (length 11.5–15 mm, commonly around 13 mm or larger, head width 3.2–3.9 mm). Europe to Japan. Associated with two-needled pines. ..... *A. posticalis*
   a. Pale area on paraantennal field usually connected with anterior part of supraocular stripe; antennal scape often largely pale-marked; pale mark on mesonotum not connected into a circle, broken at least in anterior part of mesoscutal lateral lobe; mesepisternum sometimes largely or entirely black; pseudosternum without pale marking; wings slightly but distinctly brownish; dorsum of abdomen usually largely pale brown, with a few basal segments and basal parts of other segments blackish, rarely largely blackish; venter usually with black basal part of each segment broad and well visible. [Length 11.5–15 mm, commonly around 13 mm or larger, head width 3.2–3.8 mm]. Japan (central to western Honshu, Shikoku,

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Kyushu, Tsushima; lowlands to lower mountains). Associated with *P. densiflora*. ..... *A. p. posticalis*

b. Pale area on paraantennal field usually connected with anterior part of supraocular stripe; antennal scape mostly black; pale mark on mesonotum connected into a circle, or narrowly broken in anterior part of mesoscutal lateral lobe; mesepisternum always largely pale; pseudosternum with or without pale marking; wings slightly but distinctly brownish; dorsum of abdomen largely pale brown, with a few basal segments and sometimes basal parts of other segments blackish; venter usually with black basal part of each segment narrow and invisible. [Length 11.5–14.5 mm, head width 3.4–3.9 mm]. Korea. Associated with *P. densiflora*. ..... *A. p. koreana* (part)

c. Pale area on paraantennal field usually narrowly separated from anterior part of supraocular stripe; antennal scape usually mostly black; pale mark on mesonotum not connected into a circle, broken at least in anterior part of mesoscutal lateral lobe; mesepisternum always largely pale; pseudosternum with pale marking; wings not distinctly brownish; dorsum of abdomen usually largely black, with broad lateral margins pale, rarely mostly pale brown except for a few basal segments; venter usually with black basal part of each segment narrow and invisible. [Length 11–14 mm, head width 3.3–3.8 mm]. Europe to Siberia, China. Associated with *P. sylvestris*, etc. ..... *A. p. pinivora*

10. Lateral lobe of mesoscutum with pale marking; pale area on gena dorsally extending as rather broad band and reaching posteroventral extension of lateral suture; mesoscutellum and mesepisternum always mostly pale. 11

— Lateral lobe of mesoscutum usually without pale marking; pale area on gena usually not reaching posteroventral extension of lateral suture; mesoscutellum with pale spot sometimes reduced or missing; mesepisternum often extensively black. 12

11. Coronal suture usually distinct; paraantennal field ventrally smooth and impunctate and dorsally somewhat roughened, sparsely punctate and pilose; facial crest usually inconspicuous; postgena largely pale-marked; mesepisternum entirely or almost entirely pale sordid yellow, without black marking along outer margin of pseudosternum; hind femur usually mostly pale above, with only obscure black marking; abdomen usually largely pale brown above. Korea, Primorskij kraj. Associated with five-needled pine, *Pinus koraiensis*. .... *A. parki*

— Coronal suture usually indistinct or absent; paraantennal field usually very smooth and impunctate, distinctly demarcated dorsally by rather sharply defined facial crest; postgena usually mostly black, with only ventral outer margin pale; mesepisternum pale sordid yellow, with black marking along outer

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margin of and along median line of pseudosternum; hind femur mostly black above; abdomen usually largely black above. Korea. Associated with two-needled pine, *P. densiflora*. ..... *A. posticalis koreana*

12. Length 11–12 mm, head width 3.2–3.4 mm. [Pale area on paraantennal field broadly fused with pale area around antennal socket; mesoscutellum with minute to large pale marking; color of dorsum of abdomen varying from black with only lateral margins pale to black with posterior half largely brown]. Japan (central to western Honshu, Shikoku, Kyushu, Tsushima; lowlands to lower mountains). Associated with two-needled pine, *P. densiflora*. .... *A. posticalis posticalis*

— Length 9–11 mm, head width 2.7–3.2 mm 13

13. Pale area on paraantennal field fused (narrowly or broadly) with pale area around antennal socket; mesoscutellum usually without pale marking; color of dorsum of abdomen varying from black with only lateral margins pale to black with posterior 2/3 largely pale brown. [Length 9–11 mm, head width 2.7–3.2 mm]. Europe to Siberia, China. Associated with two-needled pines, *P. sylvestris*, etc. ..... *A. posticalis pinivora*

— Pale area on paraantennal field disconnected or very narrowly fused with pale area around antennal socket; mesoscutellum usually with pale marking; abdomen black above, with only lateral margins pale. [Length 9–11 mm, head width 2.6–3.0 mm]. Japan (norterhn to central Honshu: montane to alpine *Pinus pumila* zones). Associated with five-needled pines. ..... *A. kojimai*

Acantholyda posticalis (Matsumura, 1912)

[Japanese name: Atoguro-hirata-habachi]

Remarks. This is a large-sized, widely distributed Palearctic species associated with two-needled pines. Based on the examination of 31 specimens from Japan, 50 specimens from Korea, 74 specimens from Europe, one specimen from western Siberia (Kazakhstan), one specimen from eastern Siberia (Baikal region) and two specimens from China (Shanxi), as well as the information published in the previous literature, I have recognized three subspecies in this species, though specimens showing intermediate conditions sometimes occur. They are the nominotypical subspecies from Japan, *A. posticalis koreana* n. subsp. from Korea, and *A. p. pinivora* Enslin, 1918, widely distributed from Europe, Siberia to China.

Acantholyda posticalis posticalis (Matsumura, 1912)

(Figs. 1 A–D, 4–6, 7 A–B, 11 D)

Lyda posticalis Matsumura, 1912, p. 76.

Acantholyda posticalis: Takeuchi, 1923, p. 362; Takeuchi, 1955, p. 113, pl. 51, 745; Verzhutskij, 1966, p.

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18; Kolomyietz, 1967, p. 5; Verzhutskij, 1973, p. 79; Uno *et al.*, 1975, p. 107; Kondo & Miyake, 1976, p. 5; Verzhutskij, 1981, p. 40; Miyoshi, 1988, p. 187; Taguchi, 1988, p. 58: Abe & Togashi, 1989, p. 541; Xiao *et al.*, 1992, p. 20; Xiao, 1992, p. 1208; Zhao et al., 1992, p. 1147; Shinohara & Byun, 1993, p. 96; Shinohara, 1998, p. 239. [*Partim.*]

Acantholyda pinivora: Takeuchi, 1930, p. 4; Hsiao, 1963, p. 18. [*Partim, nec* Enslin, 1918.]

Acantholyda nemoralis: Takeuchi, 1938, p. 207; Kim, 1963, p. 277; Kim, 1970, p. 123, 715; Nakamura & Enoki, 1997, p. 559. [*Partim*; *nec* Linnaeus, 1758; erroneously attributed to Thomson, 1871.]

Acantholyda sasakii: Kim, 1963, p. 278; Kim, 1970, p. 124, 715; Ko, 1969, p. 303. [*Partim*; *nec* Yano, 1916.]

Acantholyda posticalis posticalis: Lee, 1961, p. 2; Ko, 1969, p. 303. [*Partim.*]

Distribution. Japan (western to central Honshu, Shikoku [new record], Kyushu, Tsushima Is.: lowlands to lower mountains).

Type material examined. ♀ (lectotype), "Japan, Matsumura 15/VI 1906 Tokyo" "25" "Lyda posticalis Mats. det. Matsumura" "Type Matsumura" "Lectotype, Lyda posticalis Matsumura, 1912, Det. A. Shinohara, 1996" (HU). Both the antennae, apex of left mid tarsus and most of left forewing missing (thus not shown in Fig. 5).

Other material examined. HONSHU: Tochigi Pref.: 1 ♀, Otsuki, Yaita-shi, 4. V. 1972, T. Saito; 1 ♀, Utsunomiya, 18. VI. 1933, K. Sato. Tokyo Met.: 1 ♂, Yôga, Tokyo, 3. V. 1934, G. Yamamoto; 1 ♀, "Hondo, okr. Tokio, Kunitachi, 14. V. 935, N. Zhenzhurjst" (ZMUM); 1 ♀, "1924, Tokyo, T. Kano" "*Acantholyda posticalis* Mats., Atogurohiratahabachi, det. Takeuchi" (UOP); 1 ♂, "Tokyo, T. Kano" (UOP). Nagano Pref.: 1 ♀, Shichimi-onsen, 3. VI. 1985, A. Shinohara; 1 ♀, Minoto, ca. 1850 m, Yatsugatake Mts., 23–26. VII. 1996, A. Shinohara; 1 ♀, Kiso-Outaki, 26. V. 1981, H. Hara; 1 ♀ [reared by H. Kojima], "Locality: Takatô-machi, Nagano Pref., Host: *Pinus densiflora*/No. 1, 1978. 7. 9. larva collected; 1978. 7. 13, larva matured; 1979. 4. 22, adult emerged" (KU). Mie Pref.: 1 ♂, Okugano, Aoyama-cho, Naga-gun, 21. VII. 1989, T. Hirabayashi. Kyoto Pref.: 1 ♀, "1. VII. 1922, Yamashina, Takeuchi" "Acantholyda nemoralis Thom., det. Takeuchi" (UOP); 1 ♀, "10. V. 1929, Kyoto, Takeuchi" (UOP); 1 ♀, "5. V. 1932, Kyoto, Takeuchi" "*Acantholyda posticalis* Mats., det. Takeuchi, '55" "5 : 41" (UOP); 1 ♂, "4. V. 1933, Kyoto, Takeuchi" "*Acantholyda nemoralis* Thom., det. Takeuchi" (UOP); 1 ♀, "7. V. 1933, Kyoto, Takeuchi" "*Acantholyda nemoralis* Thomson" (UOP); 1 ♂, "20. VI. 1937, Kyoto, Takeuchi" (UOP); 1 ♀, "Kyoto, Takeuchi, coll. Suzuki" (UOP); 1 ♀, "Kyoto, von Herr Ooe" "N. Tosawa Collection, June 1978" (OMNH). Osaka Pref.: 1 ♀, "Minomo (Osaka), Japan, 19. VIII. 1934, Leg. N. Tosawa" "N. Tosawa Collection, June 1978" (OMNH). Hyogo Pref.: 1 ♀, "37. 7. 15, Maya" "N. Tosawa Collection, June 1978" (OMNH; antennae missing, thus not shown in Fig. 5); 1 ♀, "Tanba, Sasayama, Okano, 26. V. 1965, T. Okutani leg." (KU). Hiroshima Pref.: 1 ♀, Takano, 27. VIII. 1992, S. Nakamura; 1 ♀,

Fig. 1. *Acantholyda* spp. — A–B, *A. posticalis posticalis* (Matsumura), ♀, holotype; C–D, do., ♂, Kyoto; E–F, *A. posticalis koreana* n. subsp., ♀, holotype; G–H, do., ♂, paratopotype; I–J, *A. xiaoi* n. sp., ♀, holotype.

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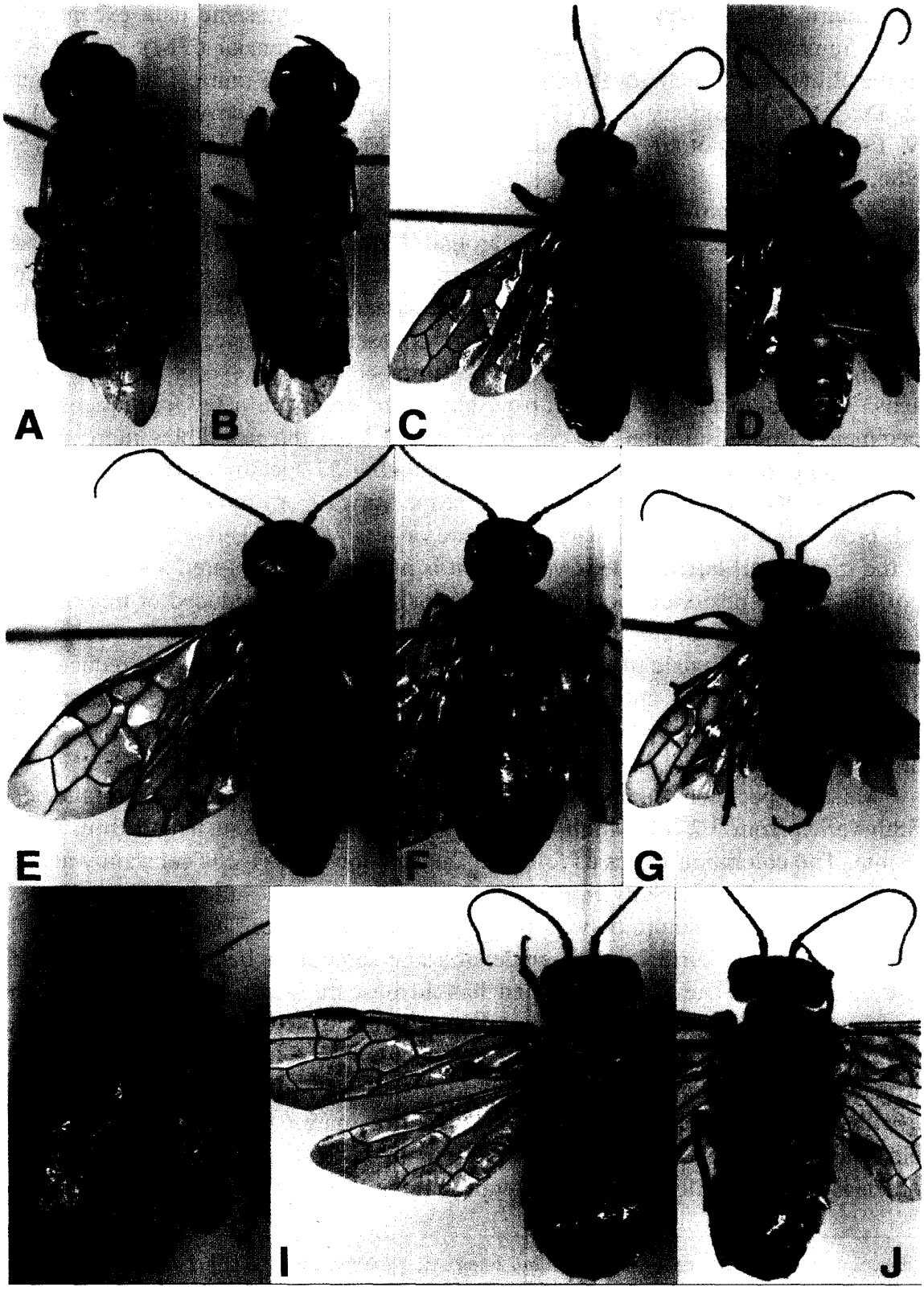

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Fujigamaru, Fukuda-chô, 26. IV. 1994, M. Sakamoto; 2♀, same data except 1. V. 1994. Yamaguchi Pref.: 1♂, Kano, 26. VII. 1981, K. Tanaka (YM). SHIKOKU: Ehime Pref.: 1♀, Tsuchigoya, Ishizuchiyama Mts., Omogo-mura, Kamiukena-gun, 12. IX. 1999, M. Shiraishi. KYUSHU: Fukuoka Pref.: 1♀, "Jariyama (Moji-ku), 5. IV. 1966" "Kumamoto 1." Nagasaki Pref.: 1♀, Mt. Maishinodan, Tsushima, 8. V. 1986, Y. Sawada.

Variation. Female (25 specimens examined; Fig. 5): Length varies from 11.5 mm to 15 mm, most frequently around 13 mm; the head width varies from 3.2 mm to 3.8 mm, and the 3rd antennal segment length from 0.7 to 1.0 mm. The coloration varies as follows: The pale area on the paraantennal field usually has a narrow linear extension along inner orbit (this stripe is absent in one specimen from Tsushima) and it reaches the anterior part of the supraocular stripe except in a few specimens. The supraocular stripe is narrow but entire except in a few specimens. Two specimens (from Tsushima and Shichimi-onsen) have the mandibles more or less marked ventrally with black, whereas the remaining 23 specimens have no blackish marking on the mandibles. The antennal scape varies from mostly black to mostly pale brown, but usually it is black and more or less pale-marked. The pale marking on the mesoscutal lateral lobe is variable; it is always separated into a small anterior spot and a large posterior spot, but the anterior spot is often reduced or missing and also the posterior spot sometimes becomes reduced, in a few specimens entirely missing or nearly so. The pale marking on the mesepisternum often becomes reduced and in a few specimens it is entirely absent. The pseudosternum has no pale marking in all the specimens examined. The abdomen is usually largely pale brown above except for a few basal segments, but in a few specimens it is largely blackish.

Male (6 specimens examined; Fig. 6): Length varies from 11 to 12 mm; the head width varies from 3.2 to 3.4 mm, and the 3rd antennal segment length from 0.7 to 0.8 mm. The coloration varies as follows: The supraocular stripe is constantly absent. The stripe extending dorsally from the genal pale area reaches the posteroventral extension of the lateral suture only in one specimen from Kano. The black spot usually covering the dorsal surface of the antennal scape sometimes becomes reduced to an obscure marking. The Kano specimen has an obscure small pale marking on the mesoscutal lateral lobe along each lateral margin of the median lobe. The pale marking on the mesoscutellum is often reduced to an obscure small spot. Of the six specimens examined, two have a largely pale mesepisternum, whereas the remaining four have the mesepisternum black, with only anterior margin and large posterior spot pale. The pseudosternum is pale-marked except in one specimen from Kyoto. The abdomen is black dorsally with only lateral margins pale in two specimens, while the

Fig. 2. *Acantholyda* spp. — A–B, *A. xiaoi* n. sp., ♂, paratopotype; C–D, *A. parki* Shinohara et Byun, ♀, paratopotype; E–F, do., ♂, paratopotype; G–H, *A. alpina* n. sp., ♀, holotype; I–J, do., ♂, paratype, Mt. Hakusan.

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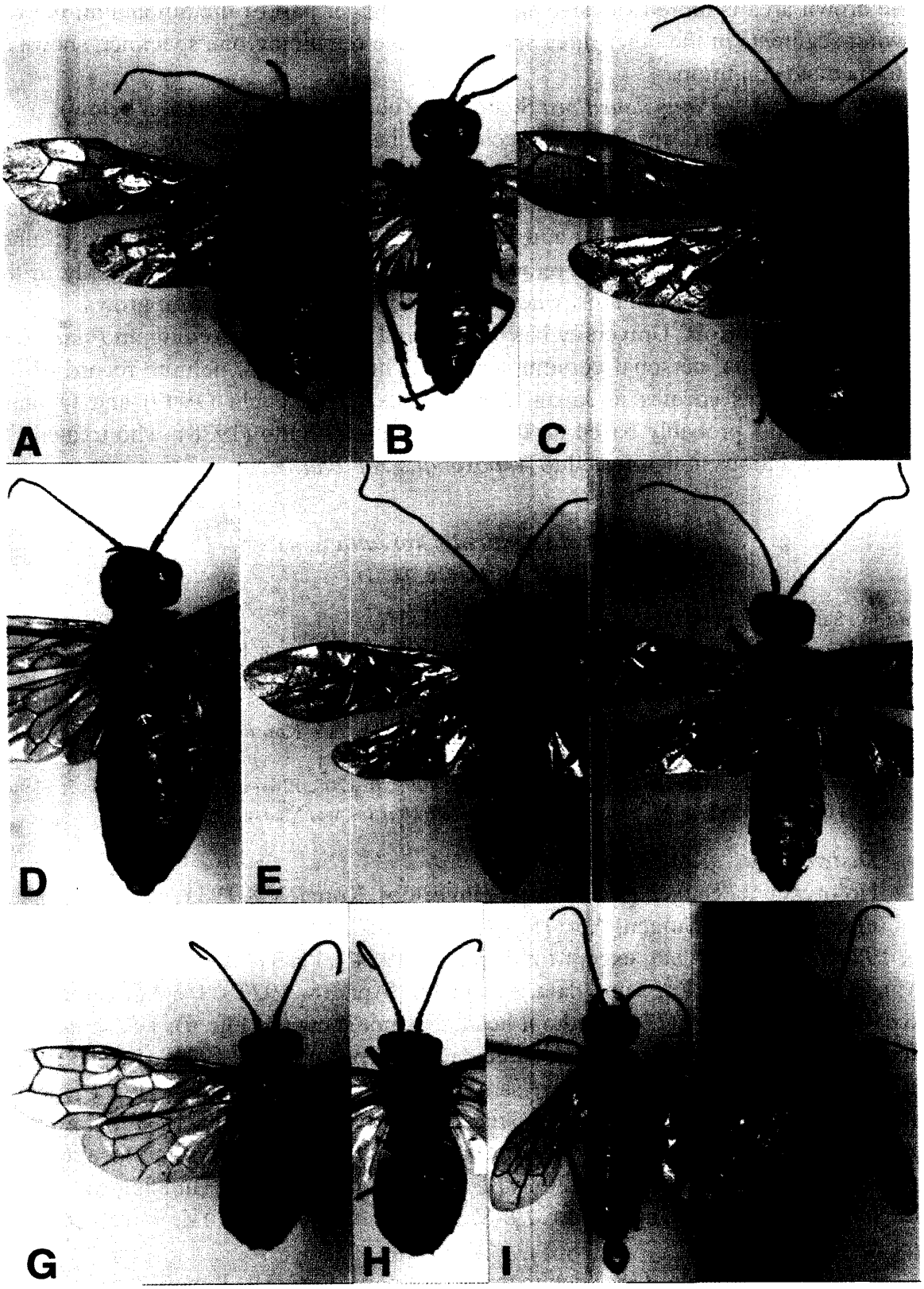

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pale brown area is more extensive and occupies larger part of the 5th and all the following segments in the other three specimens; the remaining one specimen shows an intermediate condition.

Host-plant. *Pinus densiflora* Siebold et Zuccarini (see discussion below).

Remarks. This Japanese subspecies may be separated from the other two subspecies by the characters given in the key. The holotype was recently redescribed by Shinohara and Byun (1996). The subspecies has been recorded from Honshu (Matsumura, 1912; Takeuchi, 1930) and Kyushu (Togashi, 1965) and Tsushima (Shinohara, 1998), and this is the first record from Shikoku. It has been found only in the lowlands or on lower mountains, where the host-plant *Pinus densiflora* grows.

A female in Kobe University has been reared from a larva feeding on *Pinus densiflora* (H. Kojima, personal communication). This is the first definite record of the host-plant of this species in Japan. The records by Takeuchi (1949) and Okutani (1967) are most probably based on the observation by Saito (1928), who treated the Korean populations now referred to *A. posticalis koreana*.

Acantholyda posticalis koreana n. subsp.

(Fig. 1 E–H, 5–6, 7 C–D)

Lyda sp.: Saito, 1928, p. 10.

Acantholyda sasakii: Takeuchi, 1930, p. 4; Takeuchi, 1938, p. 207; Saito, 1941, p. 129; Kim, 1963, p. 278; Kim, 1970, p. 124, 715; Ko, 1969, p. 303; Kim *et al.*, 1994, p. 216. [*Partim*; *nec* Yano, 1916.]

Lyda stellata: Saito, 1931, p. 36. [*Nec* Christ, 1791.]

Acantholyda nemoralis: Kim, 1963, p. 277; Kim, 1970, p. 123, 715; Kim *et al.*, 1994, p. 216. [*Partim*; *nec* Linnaeus, 1758; erroneously attributed to Thomson, 1871.]

Acantholyda posticalis: Xiao *et al.*, 1992, p. 20; Xiao, 1992, p. 1208; Zhao *et al.*, 1992, p. 1147; Shinohara & Byun, 1993, p. 96; Shinohara, 1998, p. 239. [*Partim*; nec Matsumura, 1912.]

Distribution. Korea.

Holotype: ♀, "Suigen [=Suwon, Kyonggi-do], Korea, V-8-1931, col. K. Sato".

Paratypes: 2♂, "Suigen, Apr. 15, 1924, K. Sato"; 1♀, same data, except for "Apr. 16, 1924"; 2♂, same data, except for "Apr. 17, 1924"; 1♀, 1♂, same data, except for "Apr. 29, 1925"; 1♀, 1♂, same data, except for "Apr. 18, 1927"; 1♀, 1♂, same data, except for "Apr. 25, 1927" (♀ without head, thus not shown in Fig. 5); 1♂, same data, except for "Apr. 29, 1927"; 9♀, 1♂, same data, except for "V–3–1931"; 5♀, 1♂, same data, except for "V–5–1931"; 11♀, same data, except for "V–8–1931"; 1♀, same data, except for "V–15–1931"; 1♀, same data, except for "V–20–1931"; 2♀, same data, except for "IV–19–1938"; 2♀, same locality, "K. Sato"; 1♀, same locality, "H. Takahashi"; 1♂, same locality, "28. VII. 57, Lee" (SNU); 1♀, "Huibang-sa, 750m, Mt. Sobaeksan, Kyongsangbuk-do, 19. V. 1987, A. Shinohara"; 1♂, same data, except for "20. V. 1987".

Variation. Female (38 specimens examined; Fig. 5): Length varies from 11.5 mm to 14.5 mm, most frequently around 13–14 mm; the head width varies from

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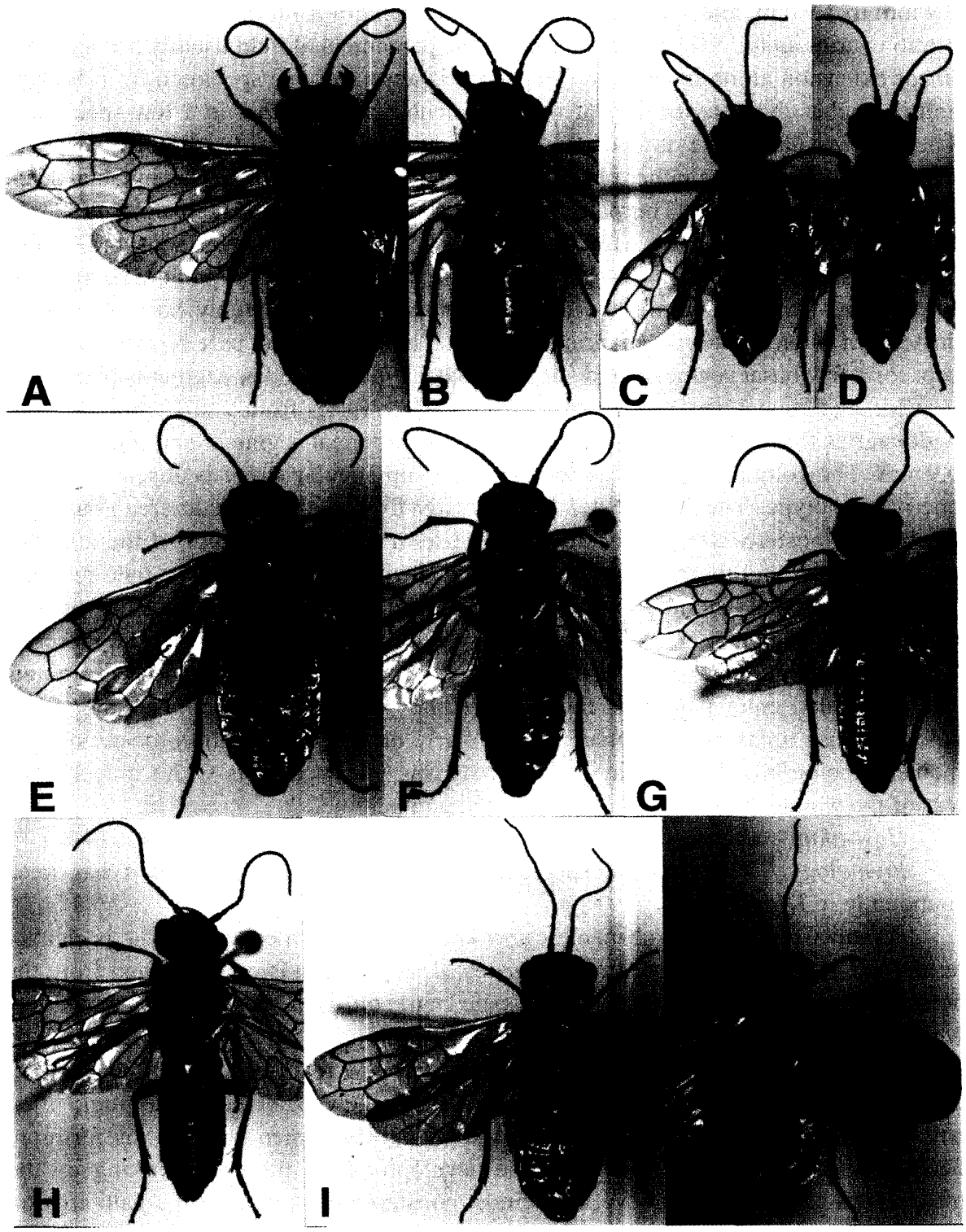

Fig. 3. *Acantholyda* spp. — A–B, *A. kojimai* n. sp., ♀, holotype; C–D, do., ♂, paratopotype; E–F, *A. pirica* n. sp., ♀, holotype; G–H, do., ♂, paratopotype; I–J, *A. kumamotoi* n. sp., ♀, holotype.

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3.4 mm to 3.9 mm, and the 3rd antennal segment length from 0.8 to 1.0 mm. The coloration varies as follows: The pale area on the paraantennal field usually has a narrow linear extension along inner orbit (this stripe is absent in one specimen from Suwon) and it reaches the anterior part of the supraocular stripe except in a few specimens. The supraocular stripe is narrow but entire except for a few specimens. The mandibles usually have rather obscure blackish marking ventrally. The antennal scape is usually mostly black. The pale marking on the mesoscutal lateral lobe is always well-developed; it is very narrowly separated into a small anterior spot and a large posterior spot, or they are not separated, thus a complete circular pale marking being formed on the mesonotum. The mesepisternum is always largely pale. The pseudosternum often has a pale marking laterally. The abdomen is pale brown above except for a few basal segments and sometimes basal parts of other segments blackish.

Male (12 specimens examined; Fig. 6): Length varies from 9 to 12 mm; the head width varies from 3.0 mm to 3.3 mm, and the 3rd antennal segment length from 0.8 to 0.9 mm. The coloration varies as follows: The supraocular stripe is absent except in one paratopotype. The stripe extending dorsally from the genal pale area constantly reaches the posteroventral extension of the lateral suture. The color of the antennal scape is stable, and the pedicel is often marked with black above. The pale marking on the mesoscutal lateral lobe is well-developed, though it is very small in one paratopotype. The pale marking on the mesoscutellum is always large. The mesepisternum, including the pseudosternum, is mostly pale in all the specimens examined. The abdominal color pattern is fairly stable, though in a few specimens, the lateral pale brownish areas on the dorsum, particularly on the 4th and more posterior segments, become broad, thus leaving rather narrow black part (its width only half or less of the whole abdominal width) along the median line.

Host-plant. *Pinus densiflora* Siebold et Zuccarini (Saito, 1928, 1931, 1941).

Etymology. This new subspecies is named "*koreana*" because it has been found only in Korea.

Remarks. This new subspecies, now known only from central Korea, is characterized by its pale coloration. In the females, *A. p. koreana* is distinguished from the nominotypical subspecies by the large pale mark on each mesoscutal lateral lobe, which is very often connected with the pale marks on the mesoscutal median lobe and mesoscutellum, together forming a large circular marking on the mesonotum, constantly mostly black antennal scape, always largely pale mesepisternum, often pale-marked pseudosternum, and always mostly pale abdomen (see the key for more details), and from *A. p. pinivora* by the development of the pale marking on the mesonotum as mentioned above, the almost constant connection of the pale area on the paraantennal field with the anterior part of the supraocular stripe, and always mostly pale abdomen. In the males, the new subspecies is distinguishable from the other two subspecies in having the lateral lobe of the mesoscutum pale-marked, the mesoscutellum and mesepisternum always mostly pale, and the pale area on the gena

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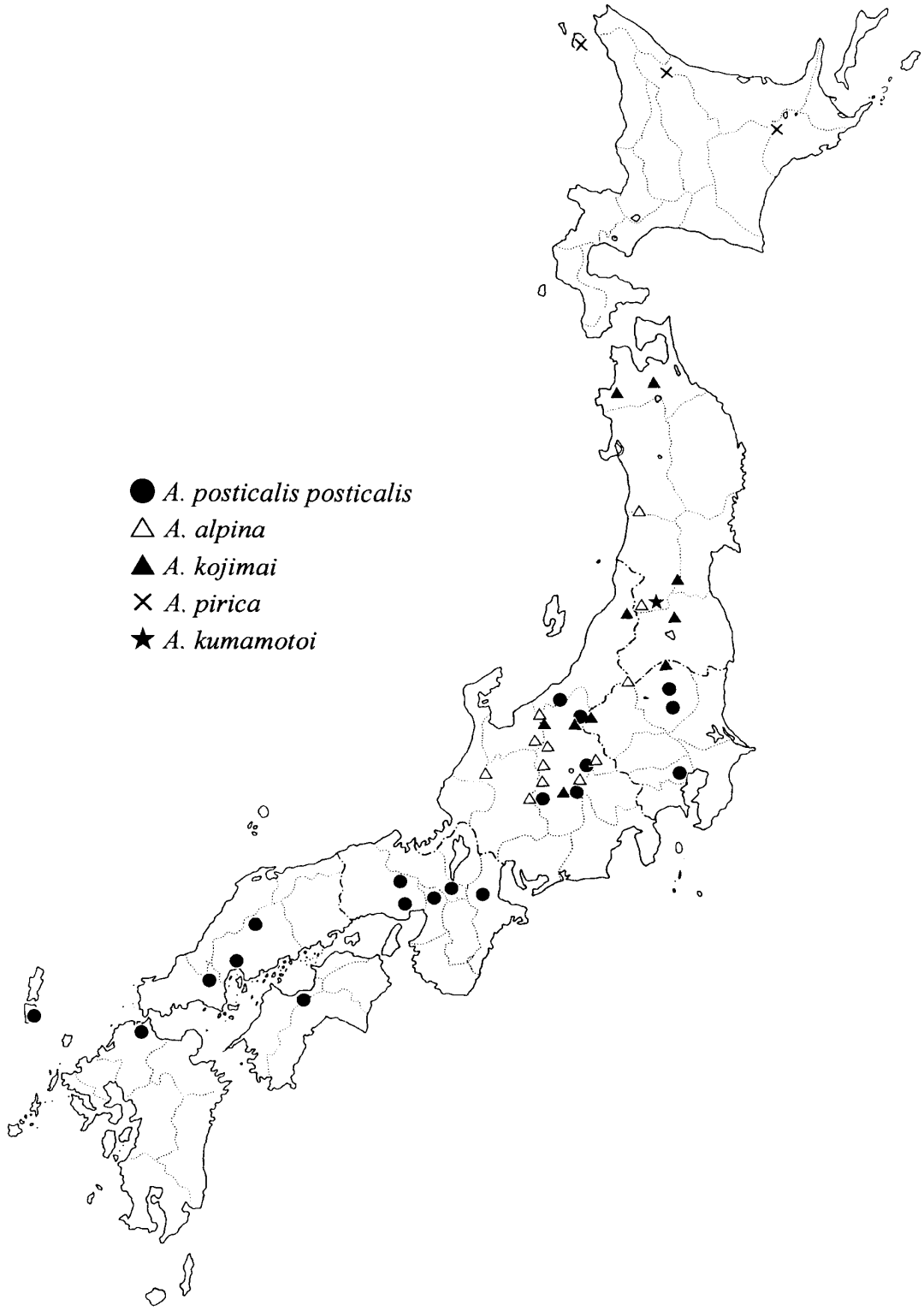

Fig. 4. Distribution of five species of the *Acantholyda posticalis* group in Japan. Data from the literature, *e.g.*, Kondo & Miyake (1976), Miyoshi (1988), and Nakamura & Enoki (1997), are not included.

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dorsally extending as a broad band and reaching the posteroventral extension of the lateral suture.

Acantholyda posticalis pinivora Enslin, 1918

(Figs. 5–6, 8 A–C)

Tenthredo stellata Christ, 1791, p. 457. [*Nec* Geoffroy, 1785.]
Tenthredo pratensis: Fabricius, 1793, p. 122. [*Nec* Linnaeus, 1758.]
Lyda nemoralis: Thomson, 1871, p. 301; Gussakovskij, 1935, p. 140, 143, 366, 367. [*Nec* Linnaeus, 1758; erroneously attributed to Thomson, 1871.]
Acantholyda pinivora Enslin, 1918, p. 678; Takeuchi, 1930, p. 4; Hsiao, 1963, p. 18; Zhao *et al.*, 1986, p. 21. [*Partim*]. [N. n. for *T. stellata* Christ.]
Acantholyda sasakii: Saito, 1941, p. 129; Kim, 1963, p. 278; Kim, 1970, p. 124, 715; Ko, 1969, p. 303. [*Partim*; *nec* Yano, 1916.]
Lyda stellata: Saito, 1931, p. 36. [*Partim*, *nec* Christ, 1791]
Acantholyda nemoralis: Takeuchi, 1938, p. 207; Koehler, 1954, p. 69; Koehler, 1957, p. 3; Koehler, 1962, p. 255; Kim, 1963, p. 277; Kim, 1970, p. 123, 715; Kim *et al.*, 1994, p. 216. [*Partim*; *nec* Linnaeus, 1758; erroneously attributed to Thomson, 1871.]
Acantholyda nemoralis var. *magnini* Pic, 1944, p. 1; Pic, 1948, p. 3; Shinohara & Lachaise, in press.
Acantholyda posticalis: Takeuchi, 1955, p. 113, pl. 51, 745; Verzhutskij, 1966, p. 18; Kolomyietz, 1967, p. 5; Verzhutskij, 1973, p. 79; Verzhutskij, 1981, p. 40; Abe & Togashi, 1989, p. 541; Xiao *et al.*, 1992, p. 20; Xiao, 1992, p. 1208; Zhao *et al.*, 1992, p. 1147; Shinohara & Byun, 1993, p. 96; Shinohara, 1998, p. 239. [*Partim.*]
Acantholyda posticalis pinivora: Lee, 1961, p. 1.
Acantholyda posticalis posticalis: Xiao & Zhao, 1983, p. 866. [*Partim.*]

Distribution. Europe across Siberia to China.

Type material examined. ♀ (holotype of *Acantholyda nemoralis* var. *magnini* Pic, 1944), "Fontainebleau (Seine et Marne)" "La Magnin [?]" "TYPE" "griffes dilatées" "Berland, n det 1943" "Acantholyda nemoralis Th. (forme à abdomen très clair)" "nemoralis Th. (pinivora Enslin) var." "v. magnini ... [?]" (MNHN). It is in a good condition though apices of both the antennae and some tarsal segments are missing.

Other material examined. SCOTLAND: 1♀, "Avimore, 24. V. 1945, P. Harwood" "British Isles: Harwood Coll., B. M. 1957–670"; 1♂, "Avimore, 24. V. 1945, P. Harwood." FRANCE: 1♀, "Museum Paris, France, Larby (s.u.o.), Ch. Delval, 1898" "Lyda stellata (pratensis)." THE NETHERLANDS: 1♀, "Bilthoven, Wt. 15. VIII. 1954, Dr. C. de Jong" "Acantholyda posticalis Matsumura (pinivora Ensl.), G. Barendrecht det., 1963" "Acantholyda posticalis (Matsumura, 1912), det. C. v. Achterberg, 1984"; 1♂, "Netherlands, Putten (Gld.), 8. IX. 1970, J. v.d. Vecht, Gressitt trap" "GT" "♂ Acantholyda posticalis Mats., det. C. v. Achterberg, 1983." GERMANY: 1♀, "Umg. München, leg. Stöcklein" "Lochhausen, Sandberg, 10.6.42" "♀" "Acantholyda pinivora Ensl., det. F. Stöcklein"; 1♀, "München, 20.5.88, Dz[?]" "Acantholyda pinivora Ensl., ♀, E. Clément det."; 1♂, same data and identification label; 2

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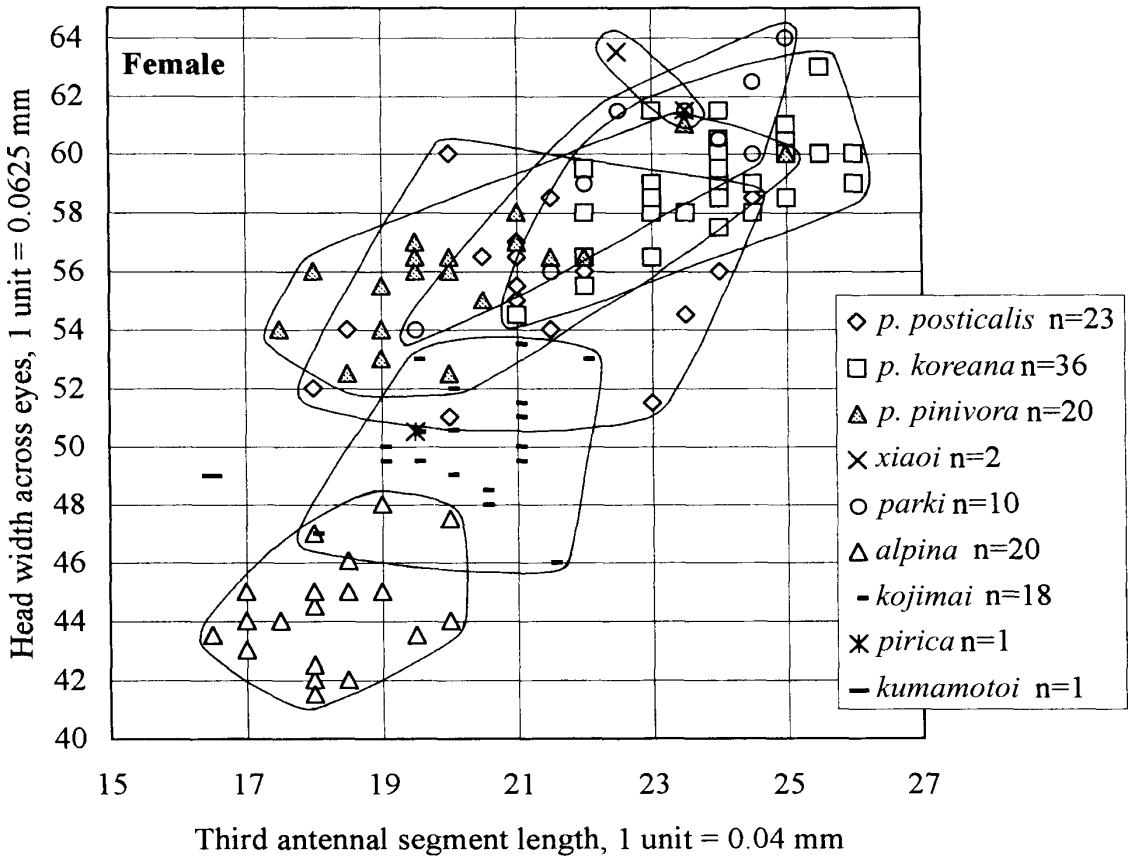

Fig. 5. Bivariate plots of head width against 3rd antennal segment length in nine species and subspecies of the *Acantholyda posticalis* group (each taxon circled, except for *A. pirica* and *A. kumamotoi*). Females.

♀, "Germany, R. Meyer" "Darmstadt, coll. Meyer" "Acantholyda pinivora Ensl." (UOP); 1♂, "Hertogenwald, G. Franck, 14. VI. 12" "Sammlung Dr. Enslin" "Acantholyda pinivora Enslin ♂"; 1♀, "Erzgebirge, coll. Lange" "A. posticalis Mats., det. A. Taeger"; 1♀, "M. Tsax[?], 29. 6. 83, Krchb." "Acantholyda pinivora Ensl., ♀, E. Clément det." ITALY: 1♂, "Calabria, Sila, Camigliatello, S. Giovanni i. F. um 39°25′N/16°35′E, 11–1300 m, 16. VI./3.VIII" (ZMB). SLOVAKIA: 1♀, "ČSSR: 30 km westl. Poprad: Vychodnh (850 m), Umg. Bioly Vah, 16–26. 6. 1982, leg. A. Taeger, 537" "Acantholyda posticalis (Matsum.) ♀ det. Taeger, 84." CROATIA(?): 1♂, "Krk.-Sisák, 15.6.66." SWEDEN: 1♀, "Hls." "Rudolphi" "Acantholyda pinivora Enslin, Malaise det." (UOP); 1♂, "O. G." "Hagl."; 1♀, "Sk. H. Väderö, 22/6, 1951, O. Lundblad." FINLAND: 1♀, "Suomi, EH: Pälkäne, 22.7.1962, 201, leg. J. Kangas" "Acantholyda posticalis (Mats.) ♀, det. J. Kangas"; 1♀, "Kangasala, Grönblom, 7.7.43"; 1♂, "Suomi, EH: Hattula, 12. 7. 1964, M. Nuorteva" "5272" "Acantholyda posticalis Mats."; 1♀, "Finland, Helsingfors, R. Forsius/13/7,11" "Acantholyda pinivora Ensl., R. Forsius det." (UOP); 1♂, same data except "10/6 02" (UOP). BUL-

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GARIA: 1♀, 49♂, Borovets, 1300–1500 m, 9–13. VII. 1975, A. Shinohara. KAZAKHSTAN: 1♀, "Naurzum zap., 1–6. VII. 1938, Zabelina" "Lyda nemoralis Thoms., L. Zimmina det., III 54" "Acantholyda posticalis Mats., A. Zhelochovtsev det." RUSSIA (Baikal region): 1♀, "17. VII. 54g, R. B. Chivyrkui [or Chivyrkuy], Popov" (almost illegible handwriting in Russian, but most probably a river near Chivyrkuiski Bay on eastern side of Lake Baikal, north of Ust Barguzin (Zinovjev, personal communication)) (VL). CHINA (Shanxi): 1♀, 1♂, "Chinese Academy of Forestry, Locality Shanxi, 1978" [in Chinese] "Acantholyda pinivora Enslin."

Variation. Female (20 specimens examined; Fig. 5): Length varies from 11 mm (abdomen unnaturally shrunk) to 14 mm, most frequently around 13 mm; the head width varies from 3.3 mm to 3.8 mm, and the 3rd antennal segment length from 0.7 to 1.0 mm. The coloration varies as follows: The pale area on the paraantennal field usually has a narrow linear extension along inner orbit (this stripe is absent in one specimen from Avimore) but it does not reach the anterior part of the supraocular stripe except in one specimen from Finland. The supraocular stripe is narrow but entire in all specimens except for a specimen from Shanxi, China (see below). Nine specimens have the mandibles more or less marked ventrally with black, whereas the remaining 11 specimens have no blackish marking on the mandibles (see also Remarks below). The antennal scape is usually mostly black, but sometimes pale-marked apically. The anterior part of the pale marking on the mesoscutal lateral lobe is medially interrupted, with the anterior spot very small or sometimes missing. The mesepisternum is always largely pale. The pseudosternum is always more or less pale-marked. The abdomen is usually largely black dorsally, with broad lateral margins pale, but sometimes it is mostly pale brown except for a few basal segments.

The female specimen from Shanxi examined has the supraocular stripe missing, no blackish marking on the mandibles, the scape partly pale brown, the pale marking on the mesoscutal lateral lobe small and restricted to the posterior part, no pale marking on the pseudosternum, the dorsum of the abdomen black with lateral margins and posterior segments largely pale brown, and the blackish anterior margins of each sternum partly visible. Xiao and Zhao (1983, Fig. 468) (reproduced in Fig. 723, Zhao *et al.*, 1992) illustrated a female most probably from Shanxi, and Zhao *et al.* (1986, p. 21, also on the page of Contents) gave a color photograph of a female from Shanxi. The abdomen of the former specimen is largely brownish, while that of the latter is predominantly black; my specimen shows an intermediate condition.

Male (59 specimens examined; Fig. 6): Length varies from 9 to 11 mm; the head width varies from 2.7 mm to 3.2 mm, and the 3rd antennal segment length from 0.6 to 0.8 mm. The coloration varies as follows: The supraocular stripe is always absent. The genal pale marking and its dorsal extension is variable; in dark specimens, the pale marking covers the gena except for the posterior margin and broad dorsal part and has no dorsal extensions, whereas in a few exceptionally pale specimens the pale area covers whole gena and extends dorsally as a stripe along the postgenal carina to

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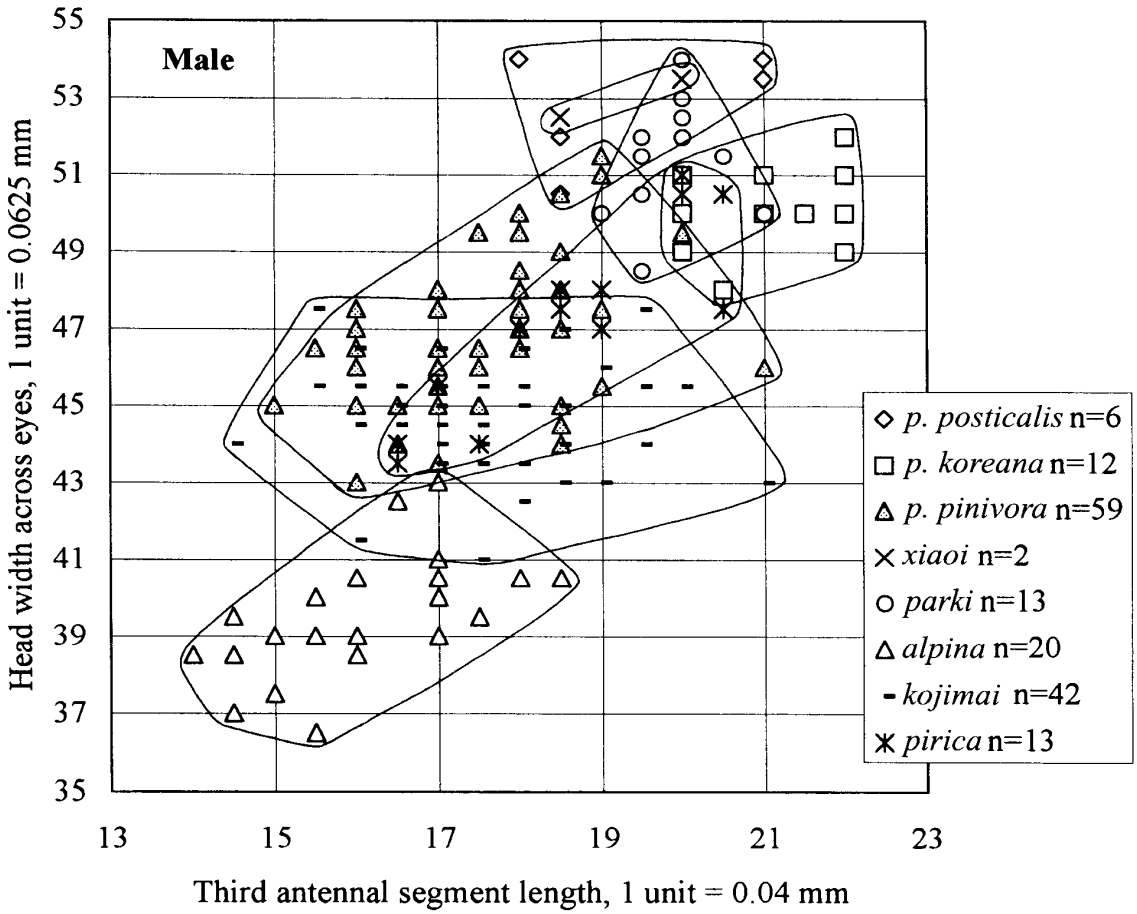

Fig. 6. Bivariate plots of head width against 3rd antennal segment length in eight species and subspecies of the *Acantholyda posticalis* group (each taxon circled). Males.

the posteroventral extension of the lateral suture; most commonly the genal spot and the dorsal stripe are widely separated, the latter often becoming obsolete. The color of the antennal scape is stable, and the pedicel rarely lacks a black spot above. The pale spot on the mesoscutal median lobe is sometimes reduced and in a few specimens completely missing. The mesoscutal lateral lobe and mesoscutellum sometimes have small pale yellow marking. The large pale marking on the mesepisternum is often broadly incised dorsally before middle; in a few specimens it is divided into a smaller anterior and a larger posterior spots, and in one Italian specimen (see below) it is completely missing. The pseudosternum has a pale marking, though it is nearly obsolete in a few specimens and perfectly absent in the Italian specimen. The dorsum of the abdomen is usually black with only lateral margins pale brown, but a pale variation often occurs where the 4th and more posterior segments are pale brown with only the narrow anterior margin of each segment black. One male specimen from Calabria, southern Italy, is extraordinary. The thorax is entirely black except for a narrow posterolateral corner of the pronotum and outer margin of the tegula, the

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coxae and trochanters are mostly black, and the femora are also black except for their ventral surfaces, whereas the abdomen is pale brown except for the entire 1st, 2nd and part of the 3rd terga, and the basal halves of the 2nd and 3rd sterna.

Host-plants. Two-needled pines: *Pinus sylvestris* and *P. nigra* in Europe and Siberia (Berland, 1949; Roberti, 1951; Kolomyietz, 1967). Roberti (1951) also gave "*P. pumilio*" (=*P. montana* var. *pumilio*, =*P. mugo*), whereas Pschorn-Walcher (1982), referring to Ferrara (1950) and Roberti (1951), cited "Weymouthskiefer" (=*P. strobus*) but not *P. mugo*. *Pinus tabuliformis* in Shanxi, China (Zhao *et al.* 1986); *P. densiflora* and *P. sylvestris* var. *mongolica* were also given by Xiao *et al.* (1992) and Zhao *et al.* (1992).

Remarks. This is a comparatively small-sized and dark-colored subspecies distinguishable from the other two subspecies by the characters given in the key. It has a very wide distribution range from Europe across Siberia to China. It has been recorded, under the name of *A. posticalis* or *A. pinivora*, from almost entire Europe (Liston, 1995), various localities in Siberia, the easternmost records from the Baikal region (Verzhutskij, 1966; Kolomyietz, 1967), and from Shanxi, Shandong, Heilongjiang, Henan, and Hunan Provinces in China (Xiao *et al.*, 1992; Xiao, 1992), though the Shandong record may actually be referred to *A. xiaoi* (see discussion under *A. xiaoi*). From the vast area of Siberia and China, only one female each from Kazakhstan and the Baikal region and a pair of specimens from Shanxi are available for study. The Kazakh and Baikal specimens are not distinguishable from a typical European specimen of *A. p. pinivora*, whereas the specimens from Shanxi, though coming very close to European specimens, do not perfectly agree with them (*e.g.*, the lack of pale marking on the pseudosternum and the long 3rd antennal segment; see also comments under "Variations"). The available information does not allow definite decision, but I would like tentatively to treat all the Siberian and Chinese populations of *A. posticalis* as belonging to the subspecies *pinivora* in this work.

The nature of the two "forms" (*A. nemoralis* f. *occidentalis* [=*serotina*] and *A. nemoralis* f. *orientalis* [=*praecox*]) segregated by Koehler (1954, 1957) is still to be clarified with further information. Following Koehler (1954), who noted "No occurence [sic] of joint early and late swarming on the same area was observed" (p. 87), Shinohara and Byun (1996) regarded the two "forms" as allopatric in distribution and noted that "Under ICZN, these names are available and should be treated as subspecies" (p. 99). Pschorn-Walcher (1980), however, noted "Da beide Formen sympatrisch auftreten (z. B. Vorkommen eines *serotina* Herdes mitten im schlesischen Befallsgebiet der *praecox*-Form), sollten nicht geographische Rassen oder Unterarten, sondern eher ein genetische fixierter Polymorphismus vorliegen, worauf auch die gemachten Übertragungsversuche hindeuten" (p. 30).

In addition to some biological characters (timing of the adult occurrence, food preference of the larvae, voltinism, etc.) and the coloration of the larvae, Koehler (1954) distinguished the two forms by the coloration of the mandibles and the cervi-

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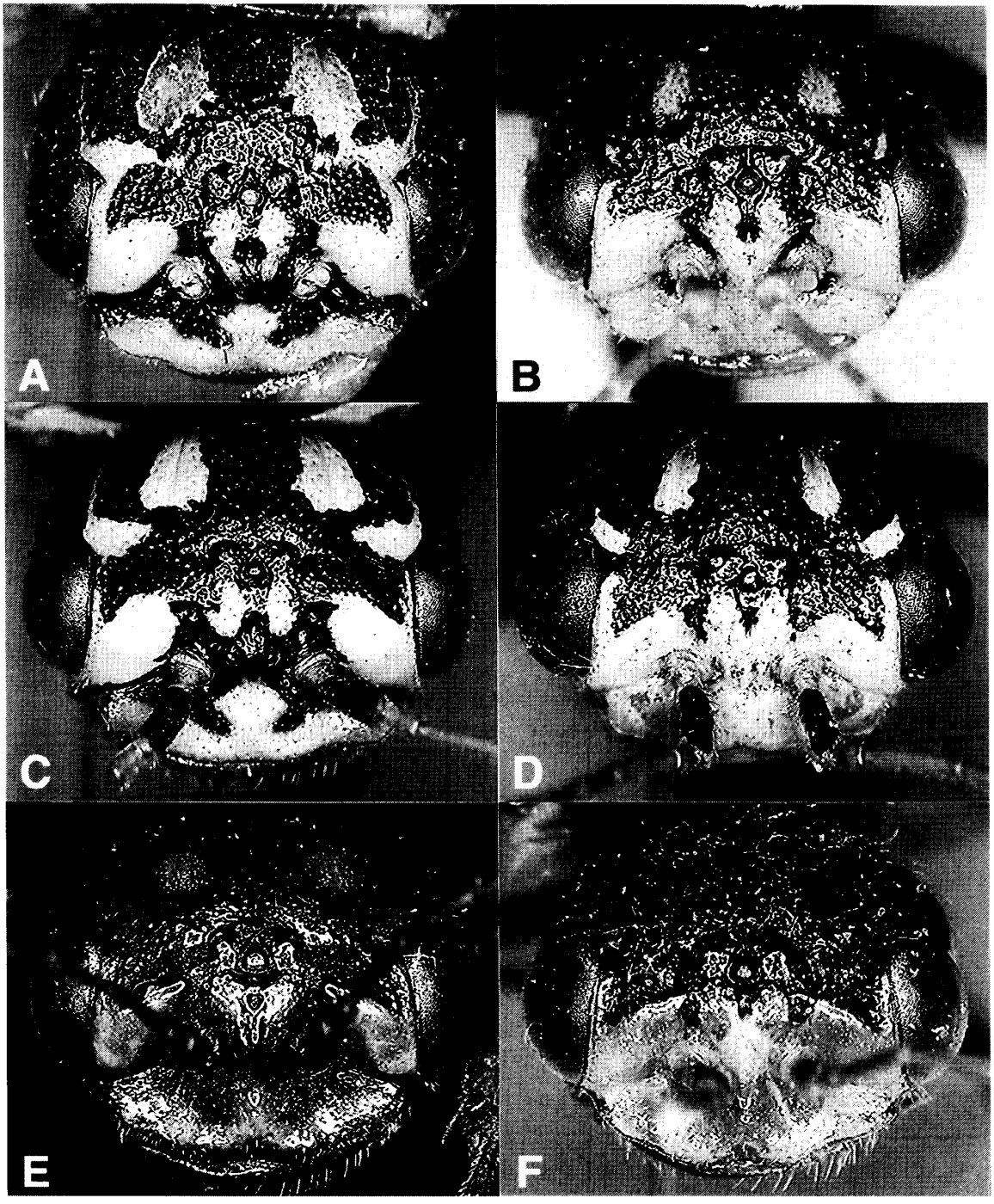

Fig. 7. *Acantholyda* spp., head. — A, *A. posticalis posticalis* (Matsumura), ♀, holotype; B, do., ♂, Kyoto; C, *A. posticalis koreana* n. subsp., ♀, holotype; D, do., ♂, paratopotype; E, *A. xiaoi* n. sp., ♀, holotype; F, do., ♂, paratopotype.

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cal sclerite of the adults. The specimens examined in this work show some variation in these characters and this variation is not clearly associated with geography or seasonal occurrence. Of the 20 females examined, eight specimens (from France, Germany [June], Finland [July] and Kazakhstan [July]) have the mandibles and the ventral surface of the cervical sclerite entirely pale, thus agreeing *occidentalis*, and five specimens (from Scotland [May], Germany [May], Bulgaria [July], Sweden and eastern Siberia [July]) have these parts more or less black-marked, thus agreeing with *orientalis*, whereas the remaining seven (from The Netherlands [August], Germany [June], Slovakia [June], Sweden [June], Finland [July] and China) are between the two forms.

The male specimen from the mountains of Sila (1100–1300 m alt.), Calabria, southern Italy, differs from the other specimens examined in having a very dark coloration of the thorax and legs and a contrastingly pale coloration of the abdomen (see comments on variation above). Because this is the only specimen available from that region, the stability of this color pattern in the population(s) and its taxonomic significance is unclear. It is, however, possible that the specimen actually represents an isolated population inhabiting mountains of southern Italy and characterized by that peculiar coloration.

Acantholyda xiaoi n. sp.

(Figs. 1 I–J, 2 A–B, 5–6, 7 E–F, 8 D–F, 11 E)

Acantholyda pinivora: Hsiao, 1963, p. 18; Zhao *et al.*, 1986, p. 21. [*Partim*, *nec* Enslin, 1917.]
Acantholyda posticalis posticalis: Xiao & Zhao, 1983, p. 866. [*Partim*, *nec* Matsumura, 1912.]
Acantholyda posticalis: Xiao *et al.*, 1992, p. 20; Xiao, 1992, p. 1208; Zhao *et al.*, 1992, p. 1147. [*Partim*, *nec* Matsumura, 1912.]

Female (holotype). Length about 13 mm; head width about 4.0 mm; 3rd antennal segment length about 0.9 mm. Head black, with pale (probably whitish yellow in life but discolored in available material) marking as in Fig. 7 E; gena pale; malar space mostly black; antenna pale brown, darkened towards apex, with scape (except for both apices including radicula) black; mandible pale, apically ferruginous. Thorax black, with the following parts pale: narrow dorsal posterior margin (medially narrowed) of pronotum, most of lateral part of pronotum, most of ventral surface of cervical sclerite, posterior 1/2–2/3 of mesoscutal median lobe, rather small posterior spot on each mesoscutal lateral lobe, large spot on mesoscutellum, very large mark (medially deeply incised below) covering most of mesepisternum, narrow spot along lateral margin of pseudosternum, small anterior and large posterior spots and narrow posterior margin of mesepimeron, metascutellum, most of metepisternum and metepimeron. Legs pale brown, with very narrow base and dorsal (posterior) surface of each coxa, and dorsal (posterior) surface of each trochanter and femur (except at extreme apex of each) black. Wings hyaline, distinctly very dark brownish; stigma

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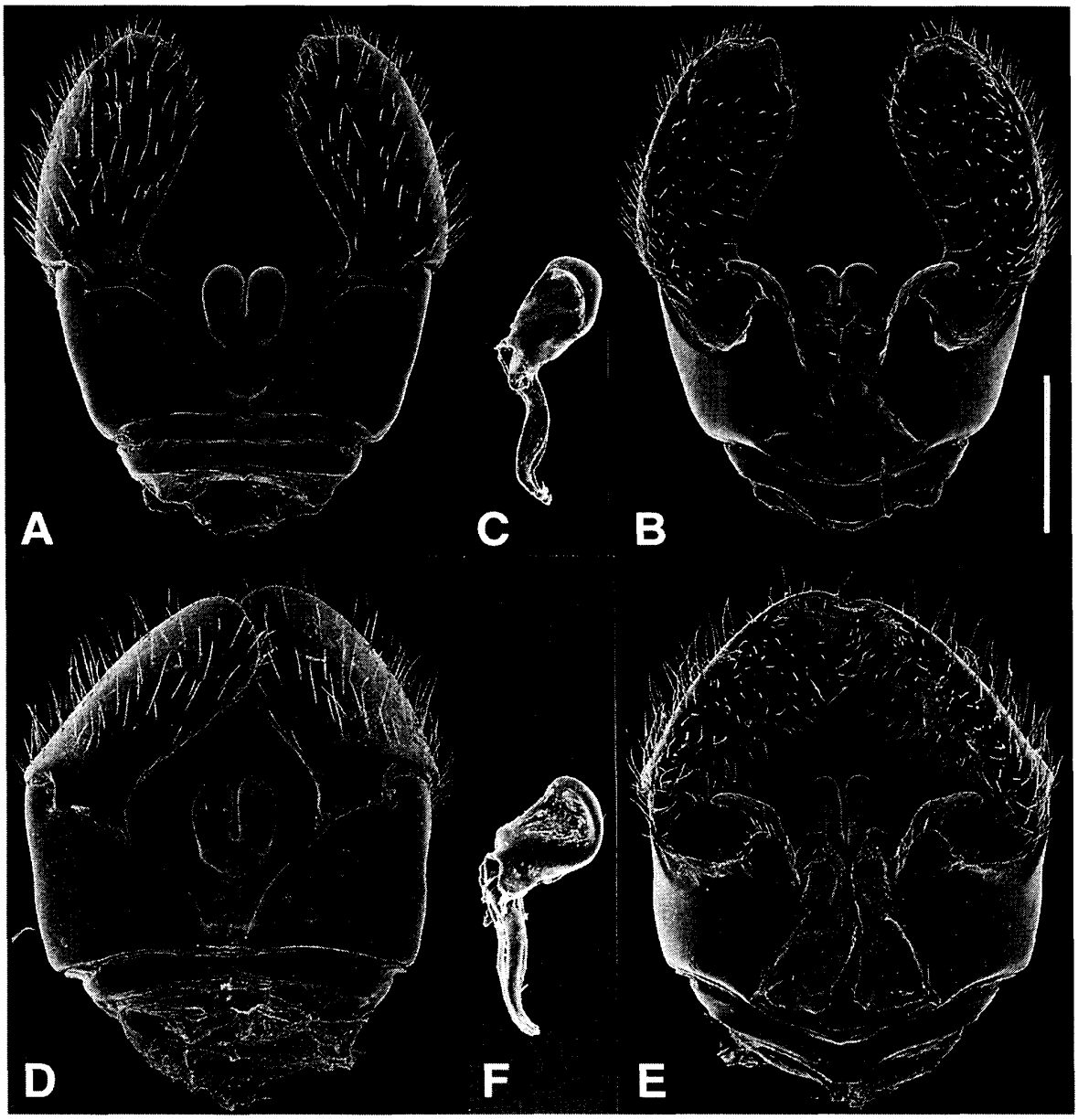

Fig. 8. Male genitalia, *Acantholyda posticalis pinivora* Enslin, Borovets, Bulgaria (A–C) and *A. xiaoi* n. sp., paratopotype (D–F). — A, D, Dorsal view; B, E, ventral view; C, F, penis valve, lateral view. Scale: 0.5 mm.

brown, somewhat darkened toward base; veins dark brown, with crossvein 1r and vein R somewhat blackish, and veins C and Sc pale brown. Abdomen black dorsally, with lateral margins pale brown, and pale brown ventrally, with basal part of 2nd sternum, large mediobasal part and medioapical triangular depressed area of 7th sternum and sawsheath black.

Clypeus with anterior margin strongly produced medially with shallowly concave apex; ocellar basin represented by broad deep furrow around median ocellus,

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very shallowly continuous to large punctiform median fovea; median ocellus and median fovea closely situated, distance between them about 0.24×distance between lateral ocellus and eye; transverse suture rather deep and distinct laterally, broadly obsolete at middle; postocellar area very slightly depressed along median line, without distinct coronal suture; left antenna 36-segmented (right one broken at apex), with 3rd segment about 2.1×length of 4th; mesepisternum nearly polished with very sparse, inconspicuous punctures.

Male (paratopotype). Length about 12 mm; head width about 3.3 mm; 3rd antennal segment length about 0.8 mm. Head black, with pale yellow marking as in Fig. 7 F; gena and malar space entirely pale yellow; mandible pale yellow, becoming dark ferruginous towards apex; antenna pale brown, becoming darker towards apex, with scape and pedicel pale yellow, dorsal surface of scape black and pedicel with obscure dark spot above. Thorax black, with following parts pale yellow: posterolateral corner of dorsal part and most of lateral part of pronotum, most of cervical sclerite, tegula, posterior half of mesoscutal median lobe, most of mesepisternum including entire pseudosternum, dorsal half of mesepimeron, most of metepisternum, and metepimeron except for dorsal and ventral margins. Legs pale yellow, with extremely narrow base of each coxa and dorsal surface of each trochanter and femur black. Wings as in female. Abdomen black, with lateral margin of dorsum, laterotergites and entire venter, except for narrow anterior margin of 2nd sternum, pale yellow.

Structure similar to that of female; left antenna 33-segmented (right one broken at apex), with 3rd segment about 2.0×length of 4th; genitalia as in Fig. 8 D–F; distivolsella with distinct "additional lobe."

Distribution. China (Shandong).

Holotype: ♀, Shandong, Mengyin, 25. VI. 1962, "*Acantholyda pinivora* Enslin."

Paratypes: 1♂, same data as for the holotype; 1♀, 1♂, Shandong, 25. VI. 1952, "*Acantholyda pinivora* Enslin, Host: pini."

Variation. Female (2 specimens examined; Fig. 5): The paratype is 14.5 mm long with the head width 3.8 mm and the 3rd antennal segment length 0.9 mm. It shows no significant differences from the holotype in coloration and structure. Male (2 specimens examined; Fig. 6): Another paratype is 11 mm long, with the head width 3.3 mm and the 3rd antennal segment length 0.7 mm. It is almost identical in coloration with the paratopotype described above; the mesepisternum of this specimen is a little smoother than that of the latter.

Host-plants. Two-needled pines, *P. tabuliformis* and *P. densiflora* are given by Hsiao (1963).

Etymology. This new species is named after Dr. Gang-Rou Xiao, Forestry Research Institute, Beijing, who pioneered the systematic and biological studies on the Chinese Cephalciinae.

Remarks. This is a large species known as a serious pest of two-needled pines in Shandong, China. It is well characterized by its peculiar shape of the clypeus and

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smooth mesepisternum, which will distinguish this new species from the other species of the *posticalis* group.

It should be noted that the concept of *A. posticalis* or *A. pinivora* of Chinese authors (Hsiao, 1963; Xiao & Zhao, 1983; Zhao *et al.*, 1986; Xiao *et al.*, 1992; Xiao, 1992; Zhao *et al.*, 1992) is actually a composite of at least two species, *A. posticalis pinivora* and *A. xiaoi*. Hsiao (1963) was the first to record "*Acantholyda pinivora*" from China, giving only the Tianma Forest in Mengyin (about 35.6 N, 118.0 E), Shandong Province as the distribution range of this species in China. Xiao and Zhao (1983) and Zhao *et al.* (1986) recorded this species from Shanxi and Shandong Provinces, reporting on its mass occurrence in Shuzhang Forest in Huguan (about 35.8 N, 113.4 E), Shanxi Province. Xiao *et al.* (1992) and Zhao *et al.* (1992) newly gave both Heilongjiang and Henan Provinces in the distribution of this species, and Xiao (1992) also added Hunan Province.

I have examined six Chinese specimens (three pairs) identified with "*Acantholyda pinivora*" by Dr. G.-R. Xiao (K.-J. Hsiao), who kindly sent them to me in 1979 for exchange. Two pairs of these are from Shandong and belong to the present new species, whereas the remaining pair from Shanxi represent *A. posticalis pinivora*. The four Shandong specimens, the type series of *A. xiaoi*, bear the labels in which only "Shandong, Mengyin" or "Shandong" are given as locality names, but they were most probably collected at the Tianma Forest.

It is considered here that the Shandong population recorded as *A. posticalis* or *A. pinivora* represents *A. xiaoi* and the Shanxi population represents *A. posticalis pinivora*, while the identity of the specimens recorded from Heilongjiang, Henan, and Hunan Provinces remains uncertain. The Shandong species treated by Liu (1990) most probably belongs to *A. xiaoi*.

Acantholyda parki Shinohara et Byun, 1996

(Figs. 2 C–F, 5–6, 9 A–B)

Acantholyda stellata: Lee & Cho, 1959, p. 96. [*Nec* Christ, 1791.]
Acantholyda sasakii: Paik, 1960. [*Nec* Yano, 1916.]
Acantholyda posticalis posticalis: Lee, 1961, p. 1; Lee, 1962, p. 21; Lee, 1963, p. 21; Ko, 1969, p. 303; Chung & Shin, 1985, p. 31; Chung & Shin, 1986, p. 126; Chung & Shin, 1994 a, p. 450; Chung & Shin, 1994 b, p. 498. [*Partim*, *nec* Matsumura, 1912.]
Acantholyda posticalis: Ko, 1964, p. 249. [*Nec* Matsumura, 1912.]
Acantholyda nemoralis: Kim, 1963, p. 277; Kim, 1970, p. 123, 715; Kim *et al.*, 1994, p. 216. [*Partim*; *nec* Linnaeus, 1758; erroneously attributed to Thomson, 1871.]
Acantholyda parki Shinohara & Byun, 1996, p. 93; Lee & Chung, 1997, p. 110.

Distribution. Korea, Russia (Primorskij kraj [new record]).

Type material. ♀ (holotype) "Hong-Cheon, 26. Jul. 1984, K. J. Won" (FRIS). Paratypes: 25♀, 30♂ listed by Shinohara and Byun (1996).

Other specimens examined. RUSSIA (PRIMORSKIJ KRAJ): 1♀, "Prim. kraj,

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Ussurijskij z-k., Sasova, 17. VII. 1979" (ZMUM).

Variation. Female (9 paratypes and 1 Russian specimen examined; Fig. 5): Length varies from 12.5 mm to 15 mm, most frequently around 14 mm; the head width varies from 3.4 mm to 4.0 mm, and the 3rd antennal segment length from 0.8 to 1.0 mm. Male (13 specimens examined; Fig. 6): Length varies from 10.5 to 12 mm; the head width varies from 3.0 mm to 3.3 mm, and the 3rd antennal segment of the specimens examined is constantly 0.8 mm long. See Shinohara and Byun (1996) for more details.

Host-plant. Korean stone pine, *Pinus koraiensis* Siebold et Zuccarini (five-needled pine).

Remarks. This is a serious pest of Korean stone pine in Korea. Biological aspects of this species were studied by Lee and Cho (1959), Lee (1961, 1962, 1963) and Chung and Shin (1985, 1986, 1994 a, 1994 b) under the names of "*Acantholyda stellata* Christ" or "*Acantholyda posticalis posticalis* Matsumura." Shinohara and Byun (1996), however, showed that this species was distinct from *A. posticalis* and described it as a new species, *A. parki*. It closely resembles *A. posticalis koreana*, which also occurs in Korea, but the two can be separated by the characters given in the key.

Acantholyda alpina n. sp.

[Japanese name: Takane-atoguro-hirata-habachi]

(Figs. 2 G–J, 4–6, 9 C–D, 10)

Acantholyda posticalis: Takeuchi, 1955, p. 113, pl. 51, 745; Togashi, 1961, p. 29; Togashi, 1965, p. 243, pl. 122, 3; Abe & Togashi, 1989, p. 541; Shinohara & Byun, 1993, p. 96; Shinohara, 1998, p. 239. [*Partim*, *nec* Matsumura, 1912.]

Female (holotype). Length about 10 mm; head width about 2.6 mm; 3rd antennal segment length about 0.7 mm. Head black, with whitish yellow marking as in Fig. 9 C; gena whitish yellow; malar space dorsally pale yellow and ventrally black; antenna pale brown, darkened towards apex, with scape (except for constriction to radicula) and dorsal basal part of pedicel black; mandible whitish yellow, largely black medially and ferruginous apically. Thorax black, with the following parts whitish yellow: dorsal posterior margin (medially interrupted) and most of lateral part of pronotum, ventral surface of cervical sclerite largely, large circular marking on mesonotum composed of posterior 2/3 of mesoscutal median lobe, anteromedially constricted broad mark on each mesoscutal lateral lobe and large spot on mesoscutellum, most of mesepisternum, elongate spot at lateral margin of pseudosternum, very narrow posterior margin of mesepimeron, metascutellum, most of metepisternum, and large spot on metepimeron. Legs pale brown, with narrow base and dorsal (posterior) surface of each coxa (hind coxa mostly pale), and dorsal (posterior) surface of each trochanter and femur (except at extreme apex of each) black. Wings almost clear hyaline; stigma

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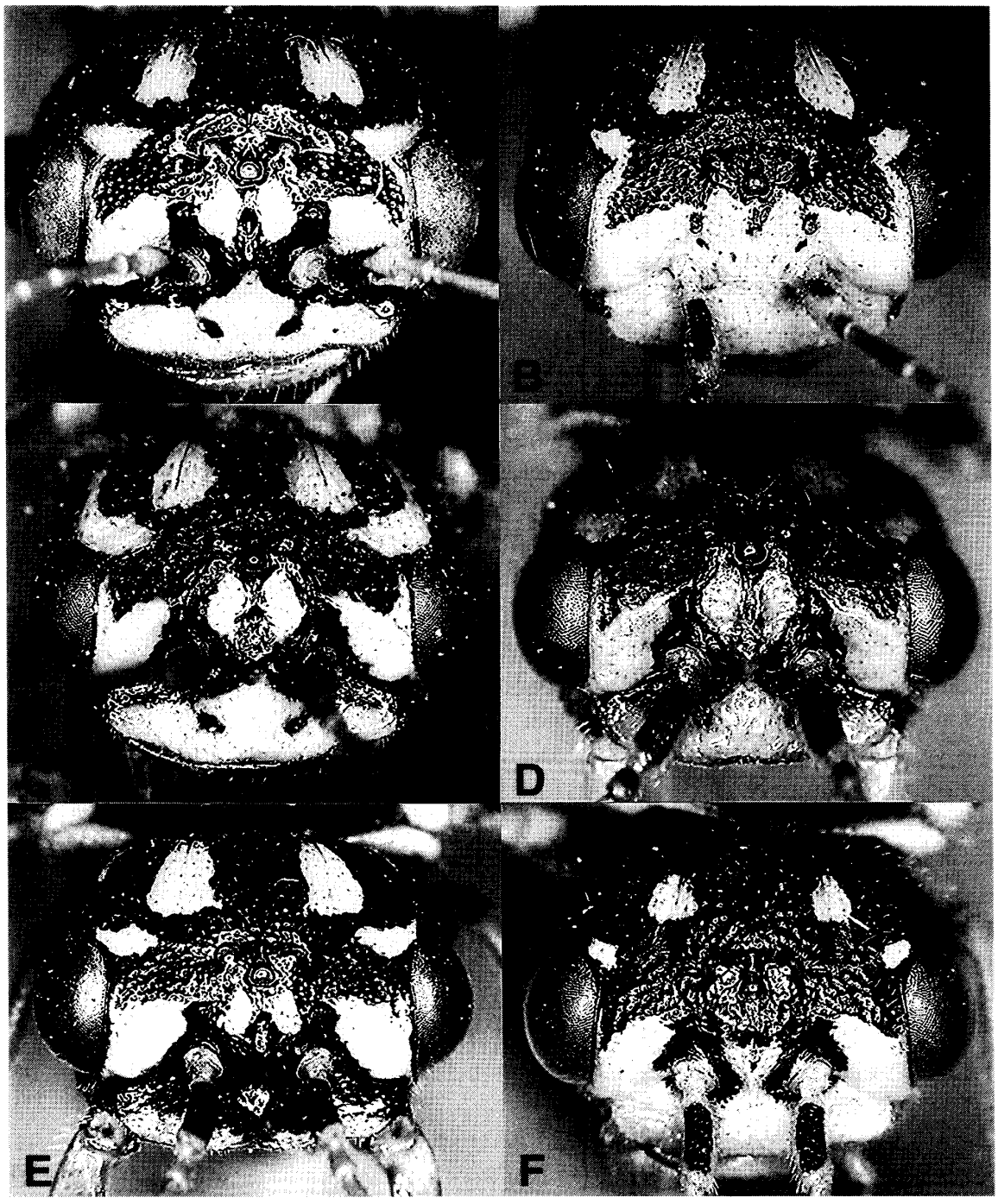

Fig. 9. *Acantholyda* spp., head. — A, *A. parki* Shinohara et Byun, ♀, paratopotype; B, do., ♂, paratopotype; C, *A. alpina* n. sp., ♀, holotype; D, do., ♂, Mt. Hakusan; E, *A. kojimai* n. sp., ♀, holotype; F, do., ♂, paratopotype.

and veins almost colorless to very pale brown, with base of stigma, crossvein 1r, apical part of vein R, and R1 somewhat blackish. Abdomen black dorsally, with lateral

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margins and posterior half of each of 4th to 8th terga pale brown, and pale brown ventrally, with basal part of each sternum and medioapical depressed area of 7th sternum black; pale areas of abdomen more or less translucent (possibly due to oily substance produced in drying process or deterioration of tissues), and black areas on each of 5th to 9th terga and all sterna, though largely concealed under the pale preceding segment, partly visible through it, thus abdominal dorsum except lateral margins and part of venter superficially appearing blackish.

Clypeus with anterior margin rather strongly produced medially with shallowly concave apex; ocellar basin represented by narrow furrow around median ocellus and shallow depression before it continuous to punctiform median fovea; distance between median ocellus and median fovea about 0.40×distance between lateral ocellus and eye; transverse suture indistinct; postocellar area not depressed along median line, without distinct coronal suture; both antennae 27-segmented, with 3rd segment about 1.9×length of 4th; mesepisternum heavily coriaceous with rather inconspicuous punctures.

Male (paratype from Mt. Hakusan). Length about 9 mm; head width about 2.3 mm; 3rd antennal segment length about 0.6 mm. Head black, with pale yellow marking as in Fig. 9 D; gena and malar space largely pale yellow; mandible pale yellow, becoming dark ferruginous towards apex, with fading blackish marking ventrally; antenna pale brown, becoming blackish towards apex, with scape and pedicel pale yellow, dorsal surfaces of scape and pedicel black. Thorax black, with following parts pale yellow: posterolateral corner of dorsal part and broad ventral margin of lateral part of pronotum, most of ventral surface of cervical sclerite, tegula, posterior half of mesoscutal median lobe, small anterior and large posterior spots on mesoscutal lateral lobe, large spot on mesoscutellum, most of mesepisternum including pseudosternum (borders broadly black), narrow posterior margin of mesepimeron, metascutellum, most of metepisternum, and anterior spot, median spot and narrow posterior margin of metepimeron. Legs pale yellow, with narrow base and dorsal (posterior) surface of each coxa, each trochanter (except on ventral surface), and dorsal (posterior) surface of each femur (except at apex of each) black. Wings as in female. Abdomen black, with lateral margin of dorsum, laterotergites and most of venter pale yellow.

Similar in structure to female; left antenna 29-segmented and right one 30-segmented, with 3rd segment about 2.0×length of 4th; genitalia as in Fig. 10 A–C; distivolsella without distinct "additional lobe."

Distribution. Japan (northern to central Honshu: alpine *Pinus pumila* zone).

Holotype: ♀, Mt. Norikuradake, Gifu Pref., 5. VIII. 1966, A. Shinohara.

Paratypes: HONSHU: Yamagata Pref.: 1♂, Mt. Chôkaizan, 11. VI. 1977, K. Baba; 1♀, Iide, Oguni-machi, 24. VII. 1965, H. Itami. Fukushima Pref.: 1♀, 4♂, Mt. Hiuchigatake, 22. VII. 1977, S. Ibuki. Nagano Pref.: 1♂, Mt. Hakubadake, 1. VIII. 1932, K. Takeuchi (UOP); 1♀, Mt. Tsubakurodake, 8. VIII. 1968, A. Shinohara (an-

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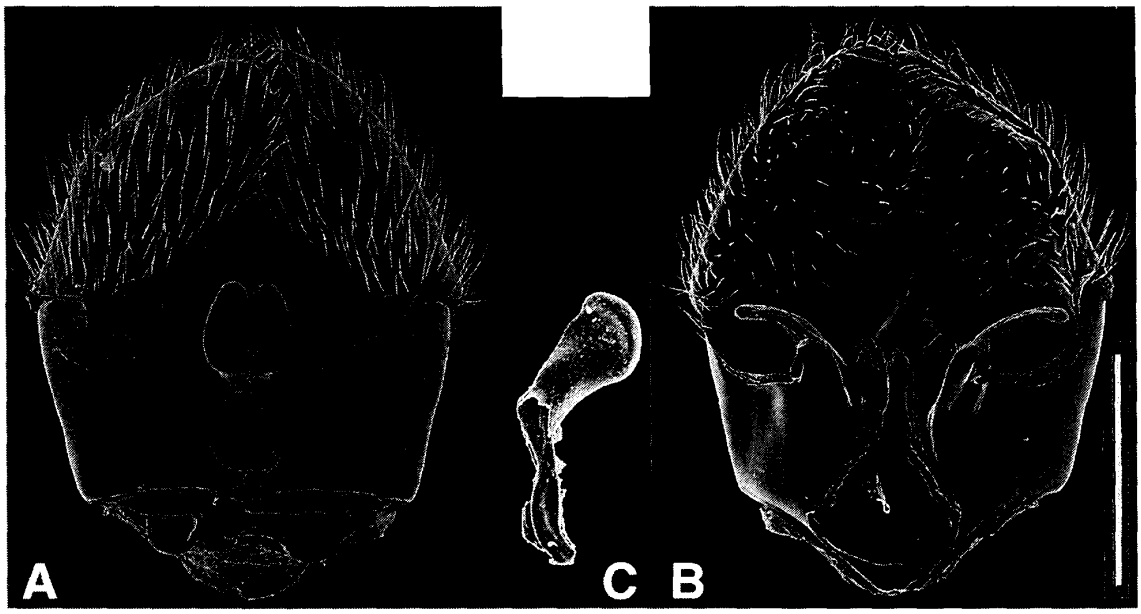

Fig. 10. Male genitalia, *Acantholyda alpina* n. sp., paratype, Mt. Hakusan. — A, Dorsal view; B, ventral view; C, penis valve, lateral view. Scale: 0.5 mm.

tennae broken, thus not shown in Fig. 5); 1♂ Mt. Jônendake, 9. VIII. 1968, A. Shinohara; 1♂, Mt. Chôgatake, 5. VII. 1964, T. Naito (KU); 1♀, Karasawa, 2300 m, nr. Kamikôchi, 1–2, VIII. 1957, R. Ishikawa; 3♂, Mt. Amidadake, Yatsugatake Mts., 26. VII. 1970, A. Shinohara; 1♀, Mt. Amidadake, Yatsugatake Mts., 26. VII. 1970, H. Nishikata; 1♀, Mt. Senjôdake, 21. VII. 1964, A. Nakanishi (KU); 2♀, Mt. Senjôdake, 2300 m, 31. VII. 1972, M. Kuboki; 1♀, Mt. Ontake, 26. VII. 1973, T. Kishii. Gifu Pref.: 2♀, Nishi-hotaka-sansou, on *Pinus pumila*, 19. VII. 1997, H. Kojima. Toyama Pref.: 1♀, 2♂, Kurobe-Genryû, "Giidaira," 26. VII. 1940, K. Takeuchi (UOP). Ishikawa Pref.: 1♀, Ohnanji, Mt. Hakusan, 19. VII. 1954, I. Togashi; 1♂, same locality, 23. VII. 1962, I. Togashi; 3♂, Mt. Hakusan, 22. VII. 1968, I. Togashi; 1♂, Mt. Hakusan, Tenbô-dô, 22. VII. 1969; 3♀, 2♂, Mt. Hakusan, Murodaira, 20. VII. 1980, I. Togashi; 1♀, same locality, 14. VII. 1982, I. Togashi; 1♀, Mt. Hakusan, 2000–2700 m, 15. VII. 1981, I. Togashi; 1♀, Mt. Hakusan, Sekkei, 14. VII. 1982, I. Togashi; 1♀, Mt. Hakusan, 2000 m, 28. VII. 1982, I. Togashi.

Variation. Female (20 specimens examined; Fig. 5): Length varies from 9.5 mm to 12 mm, most frequently around 11 mm; the head width varies from 2.6 mm to 3.0 mm, and the 3rd antennal segment length from 0.7 to 0.8 mm. The coloration shows the following variation: The pale area on the paraantennal field is usually connected by a narrow stripe with the anterior part of the supraocular stripe, but they are sometimes narrowly separated as in the holotype (Fig. 9 C). The supraocular stripe is never interrupted, usually rather broad. The mandible has a large black marking midbasally, which is reduced only in one specimen from Mt. Iide-san. The antennal scape

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is usually mostly black, but sometimes pale-marked apically. The pale marking on the mesoscutal lateral lobe is never separated into two parts, though becoming very narrow in a few specimens. The pseudosternum is always pale-marked. The abdominal color pattern is stable.

Male (20 specimens examined; Fig. 6): Length varies from 8 mm to 9.5 mm; the head width varies from 2.3 mm to 2.7 mm, and the 3rd antennal segment length from 0.6 to 0.7 mm. The coloration shows the following variation: The supraocular stripe often becomes very narrow or widely interrupted. The stripe extending dorsally from the genal pale area almost always reaches the posteroventral extension of the lateral suture. The pale spot on the mesonotal median lobe is always present. The pale spot on the mesonotal lateral lobe is usually present, only rarely absent, whereas the pale spot on the mesoscutellum is often reduced or missing. In some specimens, the broad outer margin of the mesepisternum becomes black, while the pseudosternum is always pale-marked. The abdominal color pattern is quite stable.

Host-plant. Unknown, but most probably *Pinus pumila* (Pallas) Regel.

Etymology. The specific name of this new species, *alpina*, has been selected because it occurs only in the *Pinus pumila* zone on high mountains.

Remarks. This new species is characterized by its small size (length 9.5–12 mm, usually around 11 mm, in female and 8–9.5 mm in male), usual presence of black marks on the ventral side of the mandibles, weakly pigmented wings and veins in both sexes, and presence of the circular marking on the mesonotum and the pale-marked pseudosternum in the females. It is most closely allied to *A. kojimai*; for more discussion, see remarks under the latter species.

Acantholyda alpina inhabits high mountains of northern and central Honshu and has been found only at alpine treeline sites where the community of the dwarf stone pine *Pinus pumila* develops (so-called the *Pinus pumila* zone). Such a habitat occurs over 2000–2500 meters above sea level in central Honshu.

Acantholyda kojimai n. sp.

[Japanese name: Kita-atoguro-hirata-habachi]

(Figs. 3 A–D, 4–6, 9 E–F, 12 A–C)

Female (holotype). Length about 13 mm; head width about 3.3 mm; 3rd antennal segment length about 0.8 mm. Head black, with whitish yellow marking as in Fig. 9 E; gena whitish yellow; malar space black; antenna pale brown, darkened towards apex, with scape (except for both apices including radicula) black; mandible pale yellow, apically ferruginous, left one with small obscure blackish spot medially on ventral surface. Thorax black, with the following parts whitish yellow: dorsal posterior margin (medially much narrowed) of pronotum, broad ventral margin of lateral part of pronotum, large rounded spot and inner margin of ventral surface of cervical sclerite, posterior 1/2–2/3 of mesoscutal median lobe, very small anterior and large pos-

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terior spots on each mesoscutal lateral lobe, very large spot on mesoscutellum, two very large, dorsally connected spots on mesepisternum, very narrow posterior margin of mesepimeron, metascutellum, large lateral part of metepisternum, and large spot on metepimeron. Legs pale brown, with base and dorsal (posterior) surface of each coxa, and dorsal (posterior) surface of each trochanter and femur (except at extreme apex of each) black. Wings hyaline, distinctly brownish; stigma pale brown; veins pale brown to brown, with base of stigma, crossvein 1r and apical part of vein R somewhat blackish. Abdomen black dorsally, with lateral margins and very broad posterior part of each of 4th to 9th terga and caudal part pale brown, and pale brown ventrally, with basal part of each of 2nd to 6th sterna and 7th sternum (except for broad posterolateral margins) black; pale areas of abdomen more or less translucent (possibly due to oily substance produced in drying process or deterioration of tissues), and black areas on each of 5th to 9th terga and all sterna, though largely concealed under the pale preceding segment, partly visible through it, thus abdominal dorsum except lateral margins and part of venter superficially appearing blackish.

Clypeus with anterior margin moderately produced medially with shallowly concave or truncate apex; ocellar basin represented by narrow furrow around median ocellus, rather deep posteriorly, not continuous to punctiform median fovea; distance between median ocellus and median fovea about 0.38×distance between lateral ocellus and eye; transverse suture shallow but distinct, very shortly interrupted at middle; postocellar area not depressed along median line, without distinct coronal suture; both antennae 33-segmented (right one broken at apex), with 3rd segment about 2.3×length of 4th; mesepisternum heavily coriaceous with rather inconspicuous punctures.

Male (paratopotype). Length about 10.5 mm; head width about 2.8 mm; 3rd antennal segment length about 0.7 mm. Head black, with pale yellow marking as in Fig. 9 F; gena, excepting dorsal part, and malar space pale yellow; mandible pale yellow, becoming dark ferruginous towards apex; antenna pale brown, becoming blackish towards apex, with scape and pedicel pale yellow, dorsal surface of scape black. Thorax black, with following parts pale yellow: posterolateral corner of dorsal part and large marking at ventral margin of lateral part of pronotum, spot on ventral surface of cervical sclerite, tegula, posterior half of mesoscutal median lobe, large transverse spot on mesoscutellum, two large spots on mesepisternum, most of pseudosternum, metascutellum, large medially constricted marking on metepisternum, and two rather obscure spots on metepimeron. Legs pale yellow, with narrow base and dorsal (posterior) surface of each coxa, and dorsal (posterior) surface of each trochanter and femur black. Wings as in female. Abdomen black, with lateral margins of dorsum, terminal tergum, all laterotergites, and all venter, except for anterior half of 2nd sternum, pale brown; each of other sterna with anterior margin black but this black part is concealed under the preceding segment, only posterolateral part being visible on 3rd to 7th segments.

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Structure similar to that of female; both antennae 31-segmented, with 3rd segment about 2.0×length of 4th; genitalia as in Fig. 12 A–C; distivolsella with distinct "additional lobe."

Distribution. Japan (northern to central Honshu: montane to alpine *Pinus pumila* zones).

Holotype: ♀, Sainogawara, Zaôsan Mountains, Miyagi Pref., 25. VII. 1976, A. Shinohara.

Paratypes: HONSHU: Aomori Pref.: 1♂, Mt. Iwakisan, 16. VI. 1991, M. Yamada; 3♂, same data except 17. VI. 1997; 1♀, Mt. Hakkôdasan, 16. VIII. 1930, K. Kamiya; 1♂, same locality, 24. VI. 1984, M. Yamada; 1♂, same data, except 3. VIII. 1986; 1♂, same data except 8. VII. 1989; 1♂, same data except 17. VII. 1997. Miyagi Pref.: 1♂, Mt. Maeyama, Zaôsan Mountains, 23. VI. 1974, Y. Kurosawa; 5♀, 19♂, Kamoshika Spa, Zaôsan Mountains, 24. VII. 1976, A. Shinohara; 2♀, same locality and date, K. Akiyama; 1♀, 7♂, same data as for the holotype. Niigata Pref.: 2♂, Mt. Yakemineyama, 700 m, Shibata, 4. IX. 1999, H. Itami. Fukushima Pref.: 2♀, Mt. Adatarasan, 1500 m, 8. VIII. 1997, H. Kojima. Tochigi Pref.: 2♂, Nasu, 22. VII. 1969, T. Saito; 1♀, 1♂, Nasu, 16. VII. 1970, T. Saito; 1♀, 1♂, Mt. Asahidake, Nasu, 24. VI. 1972, T. Saito; 1♀, Nasu, Mt. Asahidake, 30. VI. 1935, collector unknown. Gunma/Nagano Prefs.: 1♀, Mt. Kusatsu-shiranesan, 2000 m, 16. VI. 1991, H. Kojima. Nagano Pref.: 1♀, Mt. Kenashiyama, 1930 m, ca. 23 km east of Nagano City, on *Pinus pumila*, VII. 1998, H. Kojima; 1♀, Mt. Yokoteyama, 2300 m, Shiga-kogen, ovipositing on *Pinus pumila*, 16. VI. 1985, H. Kojima; 1♂, Tomigata, Ina-shi, 780 m, larva collected in summer 1993, adult em. IV. 1994, *Pinus parviflora*, H. Kojima (damaged, thus not shown in Fig. 6); 1♂, same locality, larva collected 11. VI. 1995, matured 12. VI., adult em. 21. IV. 1996, *Pinus parviflora*, H. Kojima; 1♂, same locality and collector (antennae broken, thus not shown in Fig. 6).

Variation. Female (18 specimens examined; Fig. 5): Length varies from 11 mm to 13 mm; the head width varies from 2.9 mm to 3.3 mm, and the 3rd antennal segment length from 0.7 to 0.9 mm. The coloration varies as follows: The pale area on the paraantennal field is separated from the anterior part of the supraocular stripe, the narrow stripe along the inner orbit extending from the paraantennal field being often reduced or missing, and even if present, not reaching the supraocular stripe. The supraocular stripe is usually very narrow, often broadly interrupted. The black marking on each mandible is usually present, becoming obscure or missing in a few specimens. The antennal scape is usually mostly black, but sometimes pale-marked apically. The anterior part of the pale marking on the mesoscutal lateral lobe is medially interrupted, with the anterior spot often missing; in one specimen from Mt. Asahidake, the interrupted parts are nearly fused. The pseudosternum is usually entirely black, narrowly pale-marked only in another specimen from Mt. Asahidake. The abdominal color pattern is rather stable, though in a few very pale specimens the abdomen appears predominantly pale brown.

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Male (44 specimens examined; Fig. 6): Length varies from 9 mm to 11 mm; the head width varies from 2.6 mm to 3.0 mm, and the 3rd antennal segment length from 0.6 to 0.8 mm. The coloration varies as follows: The supraocular stripe is absent except in one specimen from Nasu. The stripe extending dorsally from the genal pale area is usually developed, often reaching the posteroventral extension of the lateral suture. The pale spot on the mesonotal median lobe is always present. The pale spot on the mesonotal lateral lobe is absent, except in some specimens from Mt. Iwakisan, Mt. Hakkôdasan and Mt. Yakemineyama. The pale spot on the mesoscutellum is sometimes reduced or missing. The color of the mesepisternum is rather variable; it is most commonly as in the holotype, but the darkest specimen from Kamoshika-onsen has the pale marking almost absent, while the palest specimen has the mesepisternum almost entirely pale. The pseudosternum is usually largely pale-marked, though in a few specimens it is entirely black. The two specimens from Mt. Yakemineyama collected in early September have much darker wings than the other specimens. The abdominal color pattern is quite stable, whereas one exceptional specimen from Mt. Yakemineyama has a large pale brown area on the 5th to the terminal terga just as in *A. pirica*.

Host-plant. Five-needled pines: *Pinus parviflora* Siebold et Zuccarini, *Pinus pumila* (Pallas) Regel.

Etymology. This new species is named after Mr. Haruyoshi Kojima, Nagano, who has clarified the host-plants of many conifer-feeding diprionid and pamphiliid sawflies, including *A. kojimai*, by rearing experiments carried on for over twenty years.

Remarks. This new species has much in common with *A. alpina* but is distinguishable from the latter by its larger size and darker coloration. In the females of *A. kojimai*, the length is normally over 12 mm, though varying from 11 to 13 mm (normally about 11 mm with the range of 9.5–12 mm in *alpina*; see also Fig. 5 for the measurements of the head width and the 3rd antennal segment length), the pale area on the clypeus very often covers only narrow anterior margin (usually covers most of the clypeus in *alpina*), the pale area on the paraantennal field is not connected with the anterior dilated part of the supraocular stripe, the narrow stripe between them reduced, often missing (usually connected by a narrow stripe in *alpina*), the anterior part of the pale marking on the mesoscutal lateral lobe is medially interrupted, with the anterior spot often missing, thus not connected with the pale area on the median lobe (always connected in *alpina*), the pseudosternum is usually entirely black (pale-marked in *alpina*), and the wings are usually slightly but distinctly brownish (not brownish in *alpina*). In the males, *A. kojimai* is larger (length 9–11 mm, head width 2.6–3.0 mm; in *alpina* length 8–9.5 mm, head width 2.3–2.7 mm) and has the supraocular stripe usually absent (usually present, though often becoming very narrow or widely interrupted in *alpina*), the pale spot on the mesonotal lateral lobe usually absent (usually present in *alpina*), and the wings usually slightly but distinctly

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brownish (not brownish in *alpina*).

Most of the specimens of this new species have been captured in the *Pinus pumila* zone on high mountains in northern and central Honshu, whereas some specimens have been found on *Pinus parviflora* stands on lower mountains, the lowest known locality being at about 700 m above sea level in Niigata Prefecture.

Acantholyda pirica n. sp.

[Japanese name: Ezo-atoguro-hirata-habachi]

(Figs. 3 E–H, 4–6, 11 A–B, F, 12 D–F)

Female (holotype). Length about 12.5 mm; head width about 3.2 mm; 3rd antennal segment length about 0.8 mm. Head black, with whitish yellow marking as in Fig. 11 A; gena whitish yellow, except for posterior margin; malar space black; antenna pale brown, darkened towards apex, with scape (except for dark brown radicula) and dorsal basal part of pedicel black; mandible pale yellow, apically ferruginous. Thorax black, with the following parts whitish yellow: dorsal posterior margin (medially narrowed) of pronotum, broad ventral margin of lateral part of pronotum, ventral surface of cervical sclerite largely, posterior 1/2–2/3 of mesoscutal median lobe, small anterior and large posterior spots on each mesoscutal lateral lobe, large spot on mesoscutellum, two very large, nearly connected spots on mesepisternum, very narrow posterior margin of mesepimeron, metascutellum, most of metepisternum, and large spot on metepimeron. Legs pale brown, with base and dorsal (posterior) surface of each coxa, and dorsal (posterior) surface of each trochanter and femur (except at extreme apex of each) black. Wings hyaline, distinctly brownish; stigma pale brown; veins dark brown, with base of stigma, crossvein 1r and apical part of vein R somewhat blackish, and veins C, Sc and veins in basal part of wings pale brown. Abdomen black dorsally, with lateral margins and very broad posterior part of each of 4th to 8th terga and caudal part pale brown, and pale brown ventrally, with basal part of each of 2nd to 6th sterna and 7th sternum (except for broad posterolateral margins) black; pale areas of abdomen more or less translucent (possibly due to oily substance produced in drying process or deterioration of tissues), and black areas on each of 5th to 8th terga and all sterna, though largely concealed under the pale preceding segment, partly visible through it, thus abdominal dorsum, excepting lateral margins, and part of venter, superficially appearing blackish.

Clypeus with anterior margin medially strongly produced with nearly truncate apex; each of lateral parts also slightly produced anterolaterally; ocellar basin represented by narrow, shallow furrow around median ocellus, not continuous to elongate, rather shallow median fovea; distance between median ocellus and median fovea about 0.35×distance between lateral ocellus and eye; transverse suture indistinct; postocellar area not depressed along median line, without distinct coronal suture; both antennae 33-segmented (right one broken at apex), with 3rd segment about

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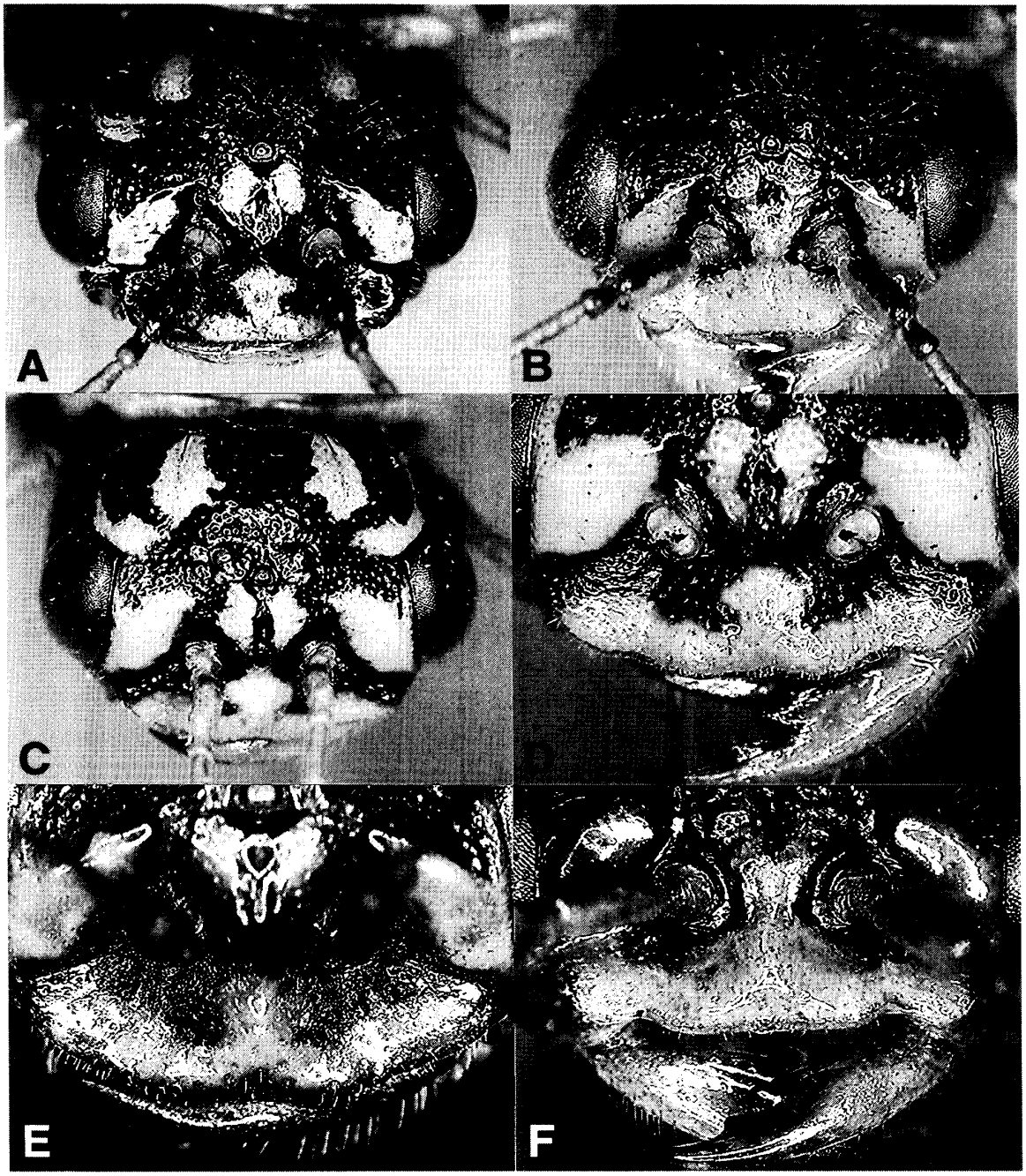

Fig. 11. *Acantholyda* spp., head.—A, *A. pirica* n. sp., ♀, holotype; B, do., ♂, paratopotype; C, *A. kumamotoi* n. sp., ♀, holotype; D, *A. posticalis posticalis* (Matsumura), ♀, holotype; E, *A. xiaoi* n. sp., ♀, holotype; F, *A. pirica* n. sp., ♂, paratopotype.

2.0×length of 4th; mesepisternum heavily coriaceous with rather inconspicuous punctures.

Male (paratopotype). Length about 11 mm; head width about 3.0 mm; 3rd antennal segment length about 0.7 mm. Head black, with pale yellow marking as in Fig.

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11 B; gena, excepting broad posterior margin and dorsal part, and most of malar space pale yellow; mandible pale yellow, becoming dark ferruginous towards apex; antenna pale brown, becoming blackish towards apex, with scape and pedicel pale yellow, dorsal surfaces of scape and pedicel black. Thorax black, with following parts pale yellow: posterolateral corner of dorsal part and ventral margin of lateral part of pronotum, most of ventral surface of cervical sclerite, tegula, posterior half of mesoscutal median lobe, transverse spot on mesoscutellum, large spot on mesepisternum, most of pseudosternum, metascutellum, most of metepisternum, and large but rather obscure spot on metepimeron. Legs pale yellow, with narrow base, dorsal (posterior) surface, and a spot on ventral surface of each coxa, and dorsal (posterior) surface of each trochanter and femur black. Wings as in female. Abdomen black, with lateral margins of anterior 4 terga, broad lateral and posterior margins (except for narrow median part of each) of 5th to 9th terga, including all laterotergites, and all venter, except for anterior half of 2nd sternum, pale yellow; each of other sterna with anterior margin black but this black part concealed under preceding segment, only posterolateral part visible on 3rd to 6th segments.

Structure similar to that of female; both antennae 33-segmented, with 3rd segment about 1.9×length of 4th; genitalia as in Fig. 12 D–F; distivolsella with distinct "additional lobe."

Distribution. Japan (Hokkaido: alpine *Pinus pumila* zone), Russia (Sakhalin).

Holotype: ♀, Mt. Rishiridake, 700–800 m, Oshidomari-guchi, Rishiri-to Is., Soya, Hokkaido, 26. VI. 1990, A. Shinohara.

Paratypes: JAPAN (HOKKAIDO): 7♂, same data as for the holotype, except for 25-26. VI. 1990; 1♂, Mt. Piyashiriyama, Kamikawa, 23. VI. 1990, A. Shinohara; 4♂, Mt. Meakandake, Tokachi, 27. VII. 1973, A. Shinohara. RUSSIA (SAKHALIN): 1♂, "Russia: Sakhalin, Tymovsky dist., Nabilskiy Khrebet, Mt. Lopatin E. env. 800–1400 m, 16–19. VII. 93, Pütz & Wrase leg." (DEI).

Variation. Male (13 specimens examined; Fig. 6): Length varies from 10 mm to 12 mm; the head width varies from 2.7 mm to 3.2 mm, and the 3rd antennal segment length from 0.7 to 0.8 mm. The coloration shows the following variation: The head color pattern is stable, with the supraocular stripe and the stripe extending dorsally from the genal pale area being always absent. The pale spot on the mesonotal median lobe is always present. The pale spot on the mesonotal lateral lobe is absent, except in one topotypical specimen which has a small obscure pale spot near the lateral margin of the median lobe. The pale spot on the mesoscutellum is usually small or almost obsolete; only in one specimen from Sakhalin, it is completely missing. The large pale marking on the mesepisternum is usually broadly incised dorsally before middle; sometimes it is divided into a smaller anterior and a larger posterior spots, and in the Sakhalin specimen, the two spots are reduced, thus the mesepisternum becoming largely black. The pseudosternum is always largely pale. The abdominal color pattern is fairly stable, though the blackish area on the dorsum varies; dark-

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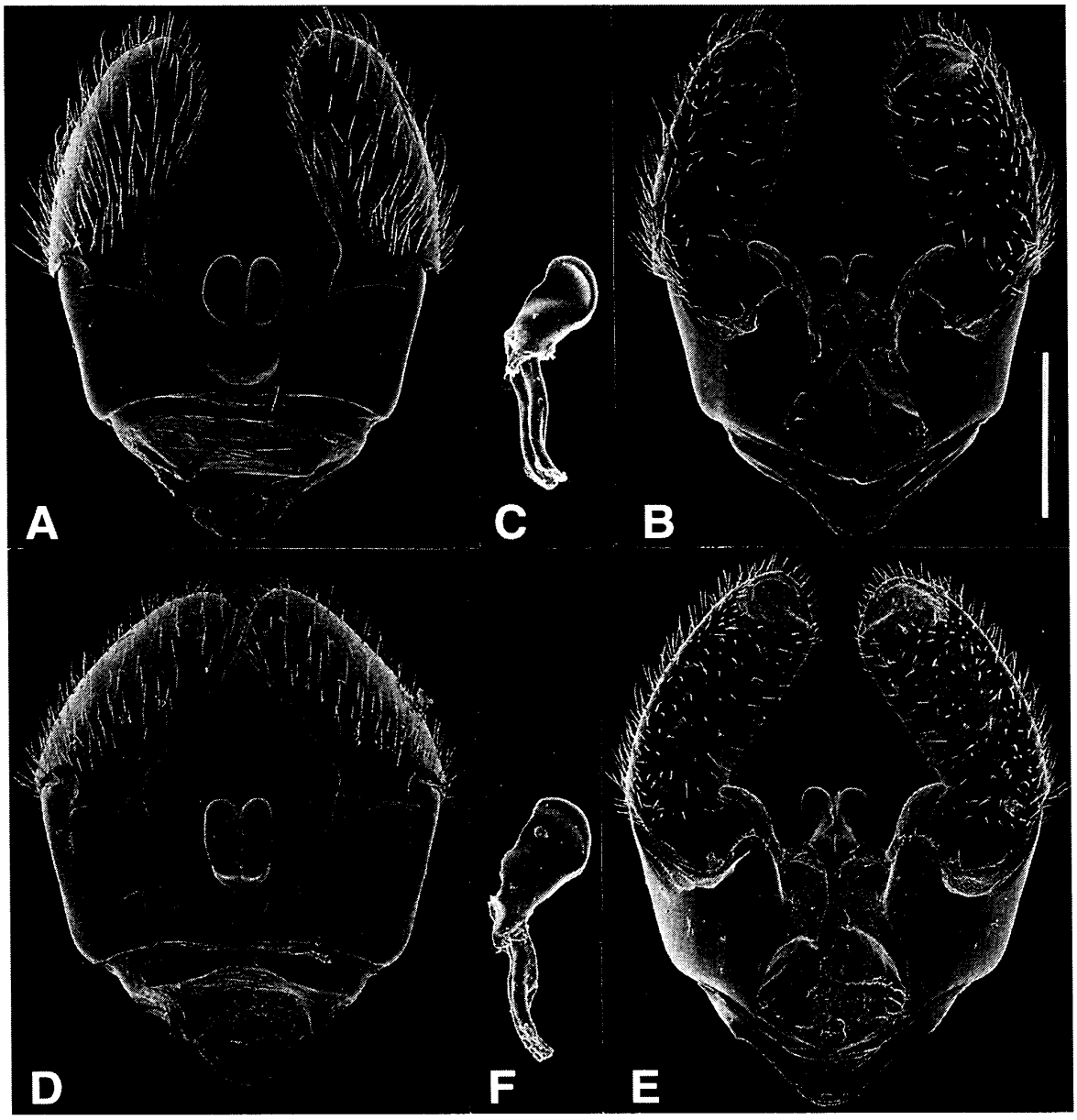

Fig. 12. Male genitalia, *Acantholyda kojimai* n. sp., paratopotype (A–C) and *A. pirica* n. sp., paratopotype (D–F). — A, D, Dorsal view; B, E, ventral view; C, F, penis valve, lateral view. Scale: 0.5 mm.

er (usually smaller) specimens have the 5th to 7th segments with broad lateral margins pale, whereas light-colored (usually larger) specimens have these segments (rarely also the 4th segment) pale brown, with only narrow anteromedian part of each segment black.

Host-plant. Unknown, but most probably *Pinus pumila* (Pallas) Regel.

Etymology. The specific name means "beautiful" in the language of the Ainu people.

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Remarks. This new species is characterized by its apparently specialized trilobed anterior margin of the clypeus, which will serve to distinguish it from the related species.

All the type specimens from Hokkaido were collected in the alpine *Pinus pumila* zone. The specimen from Sakhalin was obtained from "Mt. Lopatin E. env. 800–1400 m," a locality which should also be in a similar environment.

Acantholyda kumamotoi n. sp.

[Japanese name: Ko-atoguro-hirata-habachi]

(Figs. 3 I–J, 4–5, 11 C)

Female (holotype). Length about 10 mm; head width about 3.1 mm; 3rd antennal segment length about 0.7 mm. Head black, with pale yellow marking as in Fig. 11 C; gena pale yellow; malar space mostly black; antenna pale brown, darkened towards apex, with very large ventral black spot and obscure blackish dorsal spot on scape; mandible pale yellow, apically ferruginous. Thorax black, with the following parts pale yellow: dorsal posterior margin (medially narrowed) of pronotum and most of lateral part of pronotum, both pale areas connected along posterior margin, most ventral surface of cervical sclerite, posterior 1/2–2/3 of mesoscutal median lobe, small anterior and large posterior spots on each mesoscutal lateral lobe, large spot on mesoscutellum, most of mesepisternum, very narrow spot along lateral margin of pseudosternum, very narrow posterior margin of mesepimeron, metascutellum, most of metepisternum and metepimeron. Legs pale brown, with narrow base and dorsal (posterior) surface of each coxa, and dorsal (posterior) surface of each trochanter and femur (except at extreme apex of each) black. Wings hyaline, very distinctly brownish; stigma brown; veins brown, with base of stigma, crossvein 1r and vein R and some other veins partly somewhat blackish, and veins C and Sc pale brown. Abdomen pale brown, with propodeum, basal part of 2nd tergum, most of 9th tergum, narrow anterior margin of 2nd sternum, narrow midbasal part and midapical triangular depressed area of 7th sternum, and sawsheath black.

Clypeus with anterior margin moderately produced medially with nearly truncate apex; ocellar basin represented by rather broad deep furrow around median ocellus, continuous to elongate, sharply defined median fovea; distance between median ocellus and median fovea about 0.33×distance between lateral ocellus and eye; transverse suture shallow but distinct, shortly interrupted at middle; postocellar area not depressed along median line, without distinct coronal suture; left antenna 32-segmented (right one broken at apex), with 3rd segment about 2.2×length of 4th; mesepisternum heavily coriaceous and rugose with dense, large punctures.

Distribution. Japan (northern Honshu).

Holotype: ♀, "Iide (Yamagata-ken), 10. VII. 1975," "Kumamoto 2."

Host-plant. Unknown.

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Etymology. The specific name refers to the collector of the holotype, Mr. Hideki Kumamoto, Hirakata, a keen student of sawflies.

Remarks. This new species is known only from one female specimen and the male has not been found. With its very pale coloration of the abdomen and pale-marked pseudosternum, *A. kumamotoi* resembles *A. parki* and *A. posticalis koreana*, both occurring in Korea. *Acantholyda kumamotoi* may be distinguished from these species by its small size (length 10 mm, head width 3.2 mm; in the two other species, length 11.5–15 mm, head width 3.4–4.0 mm) and dorsally largely pale brown antennal scape.

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